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Some Grinding Operations on the Brown & Sharpe Milling Machine Spindle

By MILTON WRIGHT

A commercial production job—Methods developed by years of experience—Facilities for handling work between operations—Special machine for grinding the mortise

THE BROWN & SHARPE Manufacturing Co., Providence, R. I., has for many years made a practice of grinding the spindles of milling machines and, inasmuch as the methods of handling the parts, the machines upon which they are ground, the grain and grade of wheels used and the many other factors involved in the commercial production of high-grade machine parts are the development of these years of study and experiment, the data here set forth may be considered to represent standard practice.

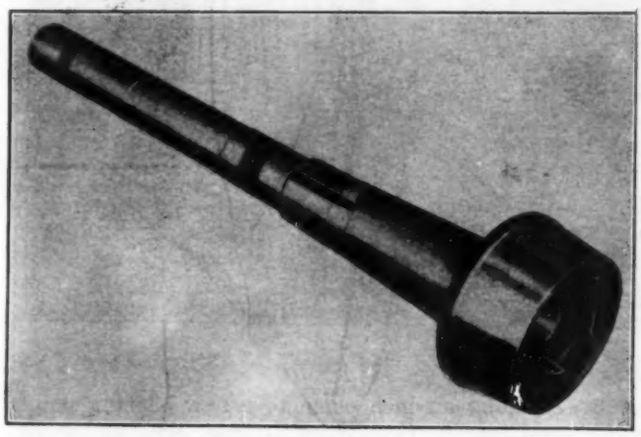


FIG. 1—BROWN & SHARPE MILLING MACHINE SPINDLE

In Fig. 1 may be seen one of the finished spindles. The grinding operations are intermediary and the work is returned to the lathe department for the cutting of threads and squaring minor shoulders, for, despite the supremacy of the grinding wheel in machining diameters with respect to both speed and accuracy, the rigid requirements in the matter of endwise measurements are still more easily and certainly met by the single sharp point of the lathe tool. The appearance of the spindle in this figure does not, however, differ greatly from that of the same piece as it is delivered to the grinding room from the heat-treating furnaces.

The first operation to be performed by the wheel is the rough-grinding of the tapered hole in the spindle, the hole to which the shanks of the cutters and other tools to be used in the finished machine are later to be fitted. For this purpose the work is set up as shown in Fig. 2 in a No. 4 Brown & Sharpe universal grinding machine, upon which the grinding head has been reversed to bring the internal fixture into action.

As in by far the larger part of small internal grinding operations, the grinding is done dry. There is, of course, a comparatively large hole extending through the piece to be ground. The work-head spindle of the grinding machine has a through hole, and the center used at this end is also hollow. To the outer end of the work-head spindle a tightly fitting hood is attached that is connected with the system of exhaust pipes that serve the entire grinding room and keep it free from dust. This connection insures a constant strong draft of air *into* the hole to be ground, and carries all the dust from grinding as well as all particles of steel and abrasive away from the wheel and operator.

In the lathe department the hole at the rear end of the spindle has been countersunk to the standard 60-deg. angle of the centers, and the hollow center of the grinding machine is made correspondingly large to accommodate it. At the opposite end, where it is to be supported by the steadyrest, is the tapered main journal; and to make this tapered surface available as a bearing spot

FIG. 2—GRINDING THE TAPER HOLE

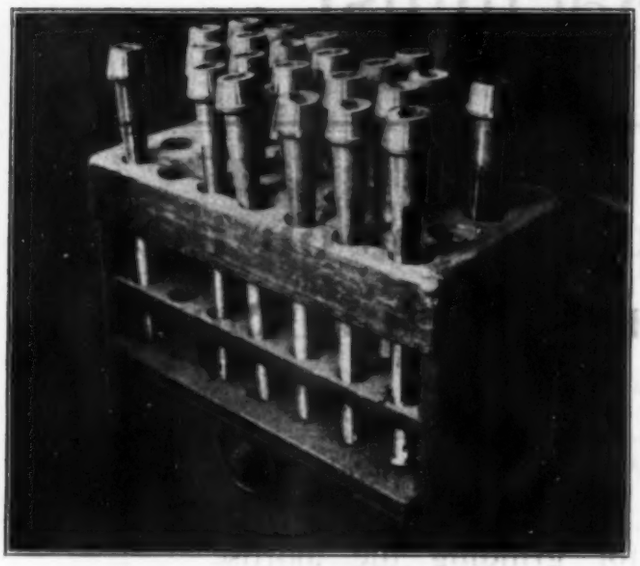


FIG. 3—TRUCKS FOR HANDLING MILLING MACHINE SPINDLES

for the jaws of the steadyrest a large diameter bushing, having a tapered hole to fit the journal is used.

The driving plate of the work head is first unscrewed a couple of turns on the spindle nose, a dog is fastened by setscrew to the small end of the spindle to be ground and a leather thong, specially prepared for the purpose, is slipped over driving plate and dog, binding them together. The driving plate is then screwed up to its shoulder and draws the work tightly against the center while the bushing previously mentioned centers the outer end in the steadyrest.

As the spindle has just come from the hardening room the journal cannot be expected to be a "good" fit in the bushing. For one thing it may have been distorted somewhat by the sudden change in temperature, and the surface is bound to be more or less rough, so that when "swung up" in the rest it may not run exactly true. Fortunately this is not at all necessary at this stage, for the rough grinding of the hole is but a preparatory operation and, even though the spindle should run out several thousandths of an inch, the error would be corrected at once in the first rough grinding of the external surface.

In connection with the use of the steadyrest upon the grinding machine a shop kink is here applied that

FIG. 4—TRUCKS FOR OTHER CLASSES OF WORK

is well worthy of notice. With jaws of cast-iron, and to even greater extent were the jaws of bronze or wood, there are bound to be more or less abrasive particles picked up by the softer metal, causing the jaws to become in effect a lap that, as the work revolves, is constantly grinding upon the outer surface of the bushing and wearing a groove that would soon put it beyond any allowable limit of error in the matter of roundness.

To forestall this effect the workman takes a piece of hard fabric (a piece of the narrow canvas belt used to drive the high-speed internal grinding spindles) attaches one end to the frame of the steadyrest so that it cannot pull away, and passes the free end around the bushing, between it and the jaws and back to the starting point where it is clamped between the upper and lower parts of the rest as the latter is closed. Compensation is made for the thickness of the fabric when adjusting the jaws.

The oil-saturated fabric provides lubrication for the bearing points and it does not retain particles of abrasive as readily as would the metal or wooden jaws. Protected in this way the bushing will run indefinitely without appreciable wear, and when in time the fabric *does* become scratchy, it is but the work of a moment

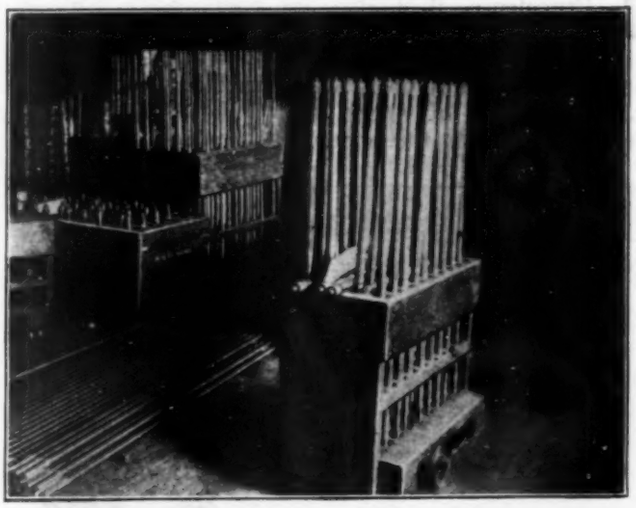


FIG. 5—A VIEW OF WORK IN PROGRESS

to move it along an inch or so to a new bearing point or to substitute a new piece. Close observation of Fig. 2 will show this protected bearing.

Having set up the first spindle and adjusted it for alignment, the table of the machine is swiveled to the required angle and the hole is ground. An alundum wheel of 80 grain, grade K, is used on this operation. About 0.008 in. of metal is removed and the requirements are that the hole shall be a good fit for a standard plug arbor and that there shall be no more than $\frac{1}{16}$ in. variation endwise in the position of the plug when it is driven in the hole. The plug arbors are provided with generous centers in the outer end, and a plug is supplied for each spindle ground, so that when the work leaves this operation it may be carried forward through succeeding operations with each piece supported upon its individual centers.

The reason for establishing the $\frac{1}{16}$-in. limit of variation endwise is so that all pieces may be practically of the same length when they are delivered to the other machines, as the variation in this respect has been found to be one of the prolific (and usually unsuspected) sources of variable results in grinding the

external surfaces. As one hole is being ground, the operator is preparing the next piece to take its place in the machine, so there is little time lost in changing work.

An important factor in the rapid handling of such pieces as the one under consideration is the means of stacking and transporting the work between operations. In this shop trucks are provided for all pieces that are too large or unwieldy to be handled in boxes, each truck specially adapted to hold the part for which it was designed. In Fig. 3 may be seen the truck for this size of milling machine spindle and in Figs. 4, 5 and 6 are shown trucks adapted to hold other parts.

The next operation is the rough grinding of all external surfaces, involving several resettings of the machine as there are three parallel shoulders of different diameters and lengths, and two tapers. All the work is done upon centers, the large center in the rear of the spindle and the outer center in the plug arbor that has become temporarily a part of the work. As the spindles are required to pass a rigid inspection after the rough grinding they are not returned to the truck immediately but are laid upon the inspector's bench adjoining the machine in which they are ground. Fig.

FIG. 6—TRUCK FOR AUTOMOBILE STEERING WORMS

7 shows the pieces at this stage with the arbors in place.

For all the exterior grinding except the taper upon the outer end of the spindle nose the work is traversed before the wheel in the usual manner. In the exception the work is done by what is here called a "set" wheel—a wheel that is as wide or wider than the shoulder to be ground—with the table held stationary and the wheel fed straight in upon the work until the automatic sizing mechanism throws the feed out of action as the correct diameter is reached. This practice is followed in grinding the sharp taper of the spindle nose.

The machine upon which the external grinding is done is also a No. 4 Brown & Sharpe universal grinding machine and the grinding is done under a flood of lubricant. The wheel used is an 18x2-in. vitrified wheel of 3,846 alundum, grade K.

A common belief that prevailed among grinding men up to a few years ago, and which still persists in many quarters, was to the effect that a wheel of very fine grain must be used to produce a smooth surface. That such is not necessarily the case is amply attested

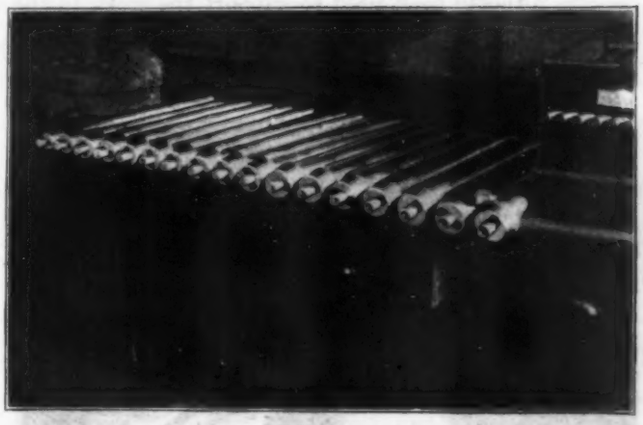


FIG. 7—ROUGH GROUND SPINDLES, READY FOR INSPECTION

by the fact that this same machine and wheel are used under very nearly the same conditions for both rough- and finish-grinding these spindles.

From the rough-grinding the pieces go to another, though similar, machine to be ground upon the face of the spindle. At the time the photographs used to illustrate this article were obtained there were no milling machine spindles at just this stage of progress but in Fig. 8 may be seen the same machine set up for facing other parts that are handled in exactly the same manner. A narrower wheel is used for this job and it is usually more satisfactory to use a somewhat softer grade because of the greater arc of contact with the work. The wheel on this machine is grade J, grain 80, alundum.

After the facing operation the holes are ground for the second time, upon the same machine and with the same set up as in the first grinding except that the bushing used to support the large end in the steadyrest is this time an accurate fit for the taper journal already ground. The diameters are brought to within 0.001 in. of finish, and extreme care is taken to have the plug arbors stand at the same distance from the finished face upon this second fitting.

The work is now sent back to the other machine to be finish-ground upon the external surface. One of the last settings in this operation is the grinding of the narrow parallel shoulder immediately back of the nose, and when the pieces are again returned to the first machine for the final grinding of the hole the bushing

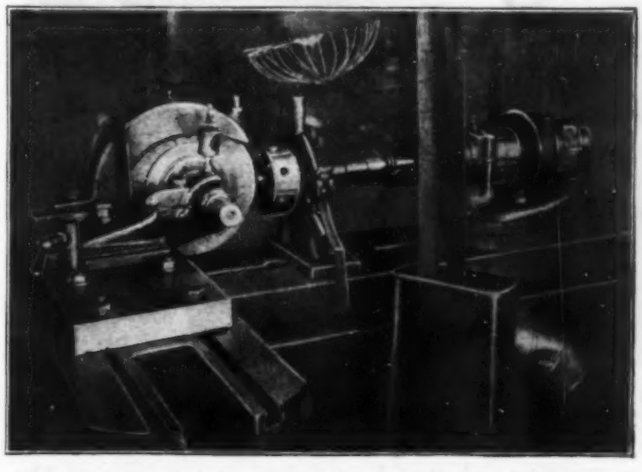


FIG. 8—A FACING OPERATION ON THE UNIVERSAL GRINDING MACHINE

that has hitherto been used to support the work in the steadyrest is dispensed with and the jaws bear directly upon this shoulder.

In the end of Brown & Sharpe milling machine spin-

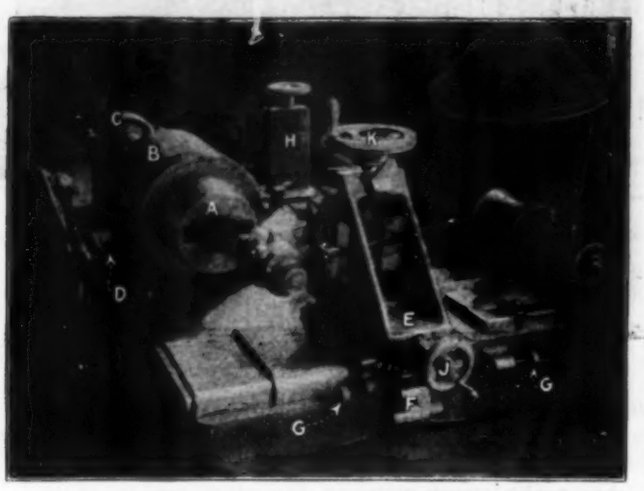


FIG. 9—THE MORTISE GRINDING MACHINE

dles there is a mortise to engage the driving lugs of cutters and other tools that are to be used in the machine, and thus relieve the taper shanks of the strain of driving. A special machine, shown in Fig. 9, has been designed to grind the parallel faces of the mortise. The width is made to very exact limits and it is essential that the mortise should be exactly central with the tapered hold-hole.

In this machine the spindle to be ground, shown at *A*, is held in hardened and ground bushings that in turn rest in fixed bearings *B* and *C* that are a part of the machine base. The bushing at the large end has a tapered hole to fit the journal of the spindle (on which it is driven) and is confined within the bearing against endwise movement. The bushing at the small end is free to float upon the rear journal of the spindle. The large bushing is provided with an accurate index by means of which it may be held in either of two positions exactly 180 deg. apart, the locking pin *D* serving to locate it.

The cross-slide *E* has a movement at right angles to the axis of the spindle to be ground, and this movement

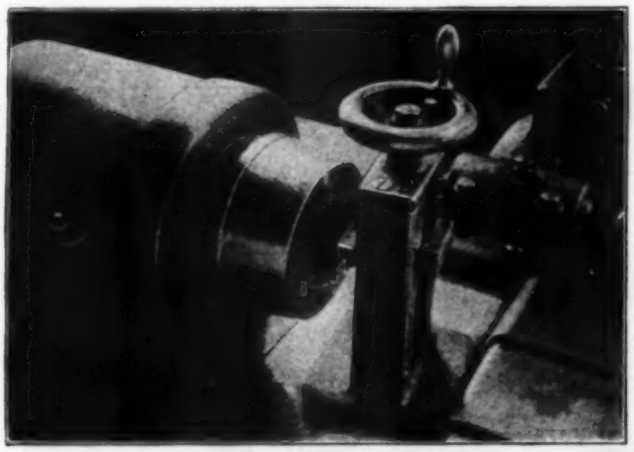


FIG. 10—SETTING GAGE FOR LOCATING THE MORTISE

is actuated by turning the capstan wheel in front of the machine. A dog *F*, attached to the base of the machine, lies between the adjustable screws *G* and limits the cross movement of the slide. The dog may be swung out of the way of the limiting screws so that the slide may be run back to clear while the operator is changing the work.

After setting in a spindle and before driving it quite tight in the bearing bushing (which now constitutes the main journal) the gage *H* is placed in position as in Fig. 10 and used to bring one side of the mortise to a horizontal plane. It is not a height gage, for the mortise has already been located with reference to the taper hole by the milling operation that produced it, and its relative position cannot now be changed in this machine beyond the limit of the grinding allowance.

The gage is not fastened to the machine in any way, but merely rests upon the finished upper surface of the machine base. By pushing the bearing block *I* into the mortise and elevating it by means of the hand-wheel at the top of the gage, the mortise is brought to a horizontal plane, after which the position of the spindle to be ground is fixed by a light blow with a soft hammer that seats it firmly in the taper hole of the bearing bushing.

Removing the locating gage, the operator brings the

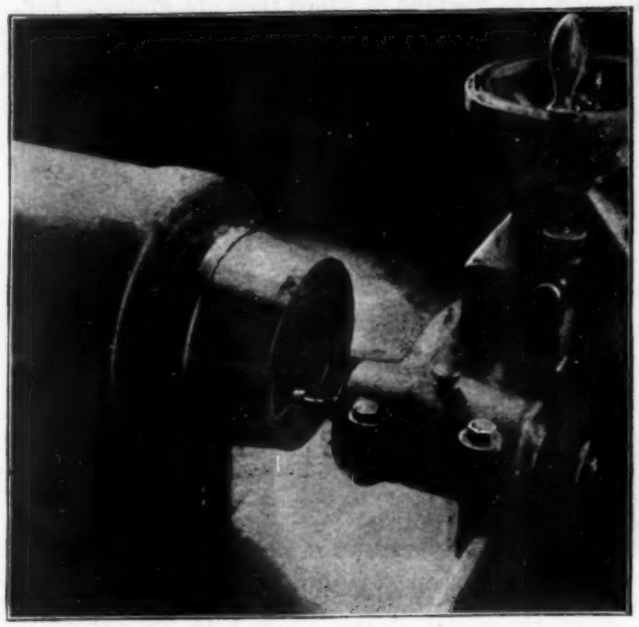


FIG. 11—READY TO GRIND THE MORTISE

cross-slide forward to the position shown in Fig. 11 by turning the capstan wheel and feeds it into the mortise by means of the small hand-wheel *J*, Fig. 9, that is keyed to the screw of the slide rest. The wheel grinds the under surface of the mortise and the work is at all times in plain view of the operator. The small hand-wheel *K* at the top of the vertical slide feeds the wheel downward as the successive cuts require it.

All of the movements of this machine are manual, and the job calls for a high degree of skill. From time to time as the work proceeds, the locking pin *D* is withdrawn and the work rotated through a half revolution so that equal amounts of stock are removed from each side of the mortise and the latter remains central with the hole.

A gage, Fig. 12, is used to determine the exact width of the mortise. This gage consists of a plug having a tapered portion to fit the hole of the spindle that is being ground and also a parallel portion upon which the gage block *L* is lapped to a neat fit. With the plug

wrung into the taper hole of the work the gage must push easily, but without shake, into the mortise and bear equally upon each side thereof.

The grinding wheel used for this work is grade K,

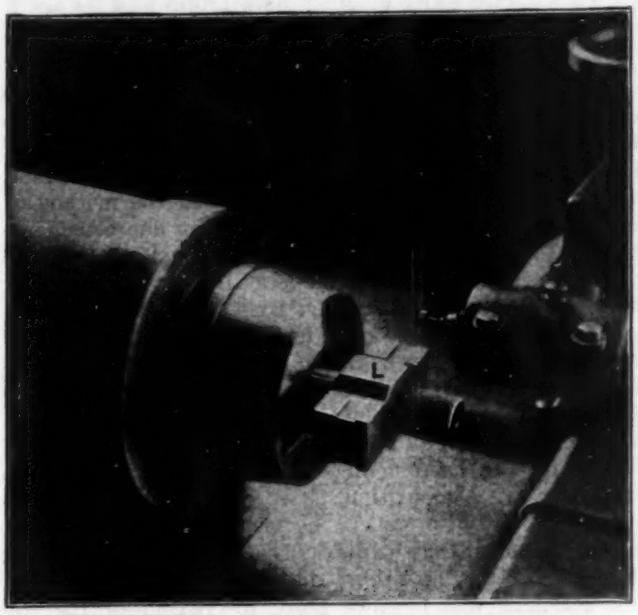


FIG. 12—GAGING THE MORTISE AFTER GRINDING

3,880 alundum. It is ½ in. in diameter and cannot be used appreciably below this size for the reason that upon its diameter depends the radius of the corners in the work. Though new wheels must be supplied at ferquent intervals in order to maintain the size, the machine is not necessarily wasteful in this respect as, after the diameter has been slightly reduced by one or two dressings the wheels are still available for the internal grinding machines, and are as good as new.

Placing Limits on Drawings

BY ALEX DOWEL

I have been very much interested in reading over the various comments and suggests regarding the placing of limits on drawings. This subject was started by John Thomas in an article entitled "Putting Limits on All Dimensions," in Vol. 56, page 639, of the *American Machinist*. It seems that Mr. Thomas' idea is to prevent errors arising by the workman's using his own judgment as to the accuracy required for dimensions on which limits have not been given. The practice in various factories seems to be quite different and yet for some reason or other machines and other devices of numerous kinds continue to be built and to function properly even when the drawings from which they are made are sadly lacking with regard to limits. We will admit that this is more or less of a mystery, yet the facts remain.

It seems to the writer, after an experience covering about twenty-five years in shop and drafting room, that the simpler a drawing can be made, the less likelihood there is of errors in making up the parts. Take for example a drawing of a shouldered shaft, having four or five diameters and with no limits specified on any part of the drawing, a workman would certainly be justified in requesting information as to the accuracy required. If we should take the same shaft and give limits on the important diameters but leave the others without limits and give no limits whatever for the various shoulder distances, the workman would probably make up the shaft, keeping the limits on the important diameters as specified and holding the other diameters within ±0.001 in. The shoulder distances would probably be machined to scale dimensions.

For the majority of work these assumptions on the part of a workman would doubtless be satisfactory, but in an exceptional case one or more of the shoulder distances might need to be accurately cut and in such an event the work done might require refinishing or it might need to be "scrapped." This would all depend upon whether it had been machined too long or too short at the important point. It appears therefore that some system is necessary to prevent occurrences of this sort and yet it does not seem feasible or desirable to place limits on all dimensions. Such a procedure would add considerable extra work to the draftsman's time and would also tend to complicate the drawing and cause the workman to expend more time on the work than necessary.

LIMITS FOR FRACTIONAL DIMENSIONS

Some factories place a note at the top of each detail sheet to the effect that "fractional dimensions must be held within limits of ± $\frac{1}{64}$ in. In the writer's experience this works very well for certain kinds of work but it does not fulfill the requirements completely as there are many cases where these tolerances are too great and yet no great accuracy is required. The obvious way to avoid trouble in a case of this sort would be to add broad limits of say ±0.005 in. to the dimensions specified if the work would permit these tolerences or if not by giving such limits as would be permissible, making both + or both — according to the requirements. For dimensions of castings where no finish is required, fractional dimensions can be used freely and without fear of complication. The finished dimension can be specified by using decimal figures and giving broad limits for unimportant surfaces and close limits for those requiring great accuracy.

In general, methods of this sort are perfectly satisfactory and the workman is provided with a drawing which is easy to read and one which is not covered with a great number of limits tending to make it appear complicated. I believe, however, that a general note at the top or bottom of every drawing, stating that all fractional dimensions are to be considered as scale or caliper measurements except where otherwise noted, will be found to answer the purpose very well in nearly all cases. Exceptional care should be taken in making drawings of work which is to be sent to outside parties for manufacturing. In looking over any drawing critically and analytically, with the idea in mind of seeing whether the information upon it is perfectly clear, the attempt should be made to put yourself in the workman's place and see if there is anything lacking which might bring up a question as to the accuracy required. If all important fits are specified with limits, and others are given so there is no possibility of an error in understanding the accuracy needed, the drawing may be passed as satisfactory for all manufacturing purposes. Too many limits on a drawing cause the workman to be overcareful and thus make the work more costly than it would otherwise be. Too few limits cause trouble by leaving the workman in doubt. We must choose a happy medium.

Shop Training

The resumption of production is proving again that we have a shortage of skilled workmen. Industries are picking the men whom they employ with more discrimination than was possible during the war. The standards of workmanship are higher and so are the moral standards.

Vestibule training was found necessary in hundreds of industries during the war. Plants employing several thousand men found this type of school almost indispensable, for regardless of their products they were forced to employ hundreds or thousands of people entirely unfamiliar with their classes of work.

Many training leaders, particularly those working outside of production, have been decidedly opposed to utilizing the foreman as a teacher. There is a vast amount of difference between "knowing how" and "teaching how," so that even if the foreman were skilled in all the operations of his department, he might still require considerable instruction himself before he could be successful in training men efficiently.

In order to attain the maximum success in training the industrial worker it is vitally important to select individuals who are fitted physically and otherwise to perform the work in hand. In order to do this properly, the jobs that are to be filled by inexperienced workers should be analyzed with the idea of determining the physical and mental requirements as well as to ascertain if there are conditions surrounding the job that make it a tax on endurance.

Early Training Advisable

In selecting men to perform work that is new to them, it is advisable to choose those under middle age as it is frequently very difficult to break men in on new lines after they have reached that age.

It is a more or less common practice when assigning new or inexperienced workers to new lines of work to mix them in with experienced workers, the idea being that the inexperienced will learn from the older hands how the operations should be performed.

When the work is done on machines there are usually a number of jobs where the operators need not know how to set up the machine to perform the work. In such cases an experienced machine setter is employed who can look after quite a number of machines and who sets them up to turn out the work as specified. The machine setters also act as instructors as to how the work should be performed.

Usually the instructors selected to train operators in one line of work do not encourage the operators to seek promotion to other lines of work requiring more skill and ability, as the position left vacant is usually filled by an inexperienced worker who must be trained by the instructor. This is a selfish attitude on the part of the instructor but it exists nevertheless. A remedy would be to base their rating on their ability to turn out experienced workers for higher grade jobs.

One very effective method of training new workers is to distribute them among the group workers. These groups are composed of experienced operators, each group performing one operation or several similar operations.

In organizing training in an industry, one of the points which must be insisted upon is a trained instructor. He may be selected for his trade knowledge, and trained to instruct; he may be an assistant foreman, or a foreman trained to instruct, but to secure the best results he must be trained to teach.

Reduced to Simple Language

This is probably the most difficult point, to sell to the executives of an industry; because we have formed the habit of considering the possession of a great store of knowledge as the principal requirement of a teacher, with personality as a minor factor, and the method of imparting this knowledge is never given due consideration. Another difficulty in the way of selling the idea of trained teachers in an industry lies in the fact that almost all pedagogy has been written in technical language, comprehensible only to those who have received long training in English. It is entirely possible, however, to present simple fundamental teaching principles in language which can be understood by anyone with a working knowledge of English.

The idea of keeping a trained instructor on the job will meet with opposition, as it will be considered too costly. This objection can be met in two ways: First, it can be shown that, while functioning as an instructor, he can be self supporting; that is, over a given period, the learners will produce more by reason of the improved supervision, and moreover the period of training will be shorter. Second, when not needed as an instructor, he can become a producer himself, either as a mechanic, or as a foreman.

There should first be made a survey to determine the requirements of the shop in new men; that is, the entire working force should be classified, and the number of individuals in each classification determined. If possible, the percentage of turnover should also be determined at this time. From this it will be found that the shop will have need of a definite number of new workers in a given trade classification each month. If this number exceeds the capacity of one instructor, two men should be selected from this trade group. If it is found that the number in a given classification will not require the services of one full-time instructor, two or more related classifications may be combined with one man selected who could handle them all.

Choosing the Teacher

In the selection of potential instructors, it is not necessary to choose the speediest workers, in fact there is some evidence which points to the possibility that the less speedy worker will make a better instructor. They should, however, have a thorough working knowledge of the trade, or of that part of the trade which they are expected to teach.

When the instructional force has been trained, the job will be governed entirely by the requirements of the local situation; they may be used in a separate department having its own equipment and to which certain work is assigned; they may be given a definite department in a shop in which they will handle all of the instructional work; they may be placed on a particular type of work, and have their students scattered through the plant wherever this work is done; or they may be placed as assistant foremen, having other responsibilities in addition to those of instruction.

Under any circumstances the instructor should be entirely free, so far as the instructional phase of the work is concerned.

Abstract of a committee report presented at the first annual convention of the National Personnel Association, Pittsburgh, Pa., Nov. 8-10, 1922.

Repairing Locomotives on Ford's Railway

By FRED H. COLVIN
Editor, *American Machinist*

The second of two articles—Grinding guides—Special frame planer and slotter—Forge, flue and air brake shops—Erecting shop with revolving crane sling

CROSSHEAD guide bars are finished by grinding on a Norton surface grinding machine, as shown in Fig. 15. Grinding is done with a wide face wheel, a magnetic chuck being used for holding the work. A special machine for machining locomotive frames is the combined planer and slotter, shown in Fig. 16, which was built by the Liberty Machine Tool Co., to the designs of M. L. Bricker, Superintendent of the River Rouge plant. The slotter housings set back to back with those for the planer, the slotter head traveling on a cross rail, as can be seen. This rail can be adjusted to the desired angle so that the tapered sides of locomotive frame jaws can be machined without disturbing the setting of the work. In this machine both the planing and slotting are done without removing the frames from the table.

One portion of the shop is devoted to boiler flue repairs, as shown in Fig. 17. The flues come in from the erecting shop after being cleaned, and are deposited on the rails *A* and *B*. As many flues as can be handled conveniently are then placed with their ends in the furnace *C*, and after being heated go to the hot cutting-off saw *D*. Passing on to the stack *E*, they are ready to be reheated in furnace *F* and have the safe ends welded on by the machine shown at *G*. This department is very compact and the work can be rapidly handled.

At the lower end of the same building is the blacksmith shop shown in Fig. 18. The power hammers are in the center of the forge shop, and the smaller blacksmith forges on each side. The substantial cast-iron mountings for the anvils are something of a departure from usual practice.

At one end of the machine shop, Fig. 19, is the department for air-brake repairs. Its proximity to some of the machine tools can be seen by observing the end of the Lucas boring machine at the left, which is at work on the end of a side rod for one of the freight locomotives. The outer end of the rod is supported by a chain hoist from a wall jib crane. This boring machine and the planer beside it are frequently used in making air pump repairs.

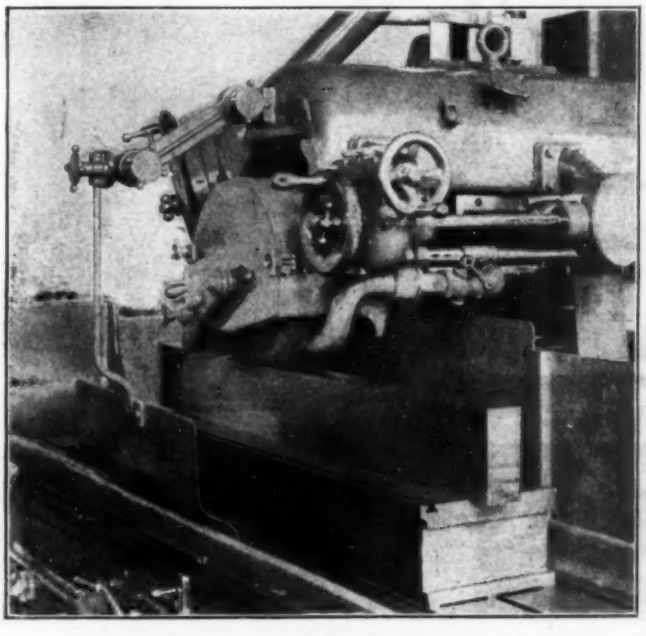


FIG. 15—GRINDING GUIDE BARS

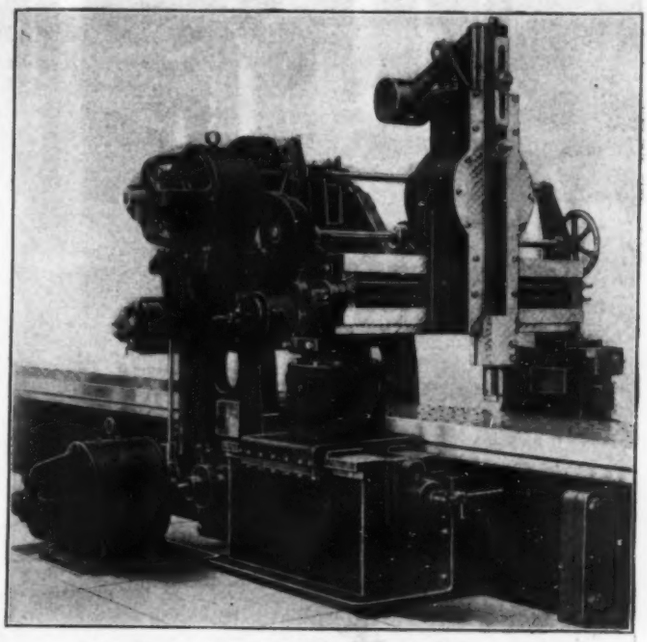
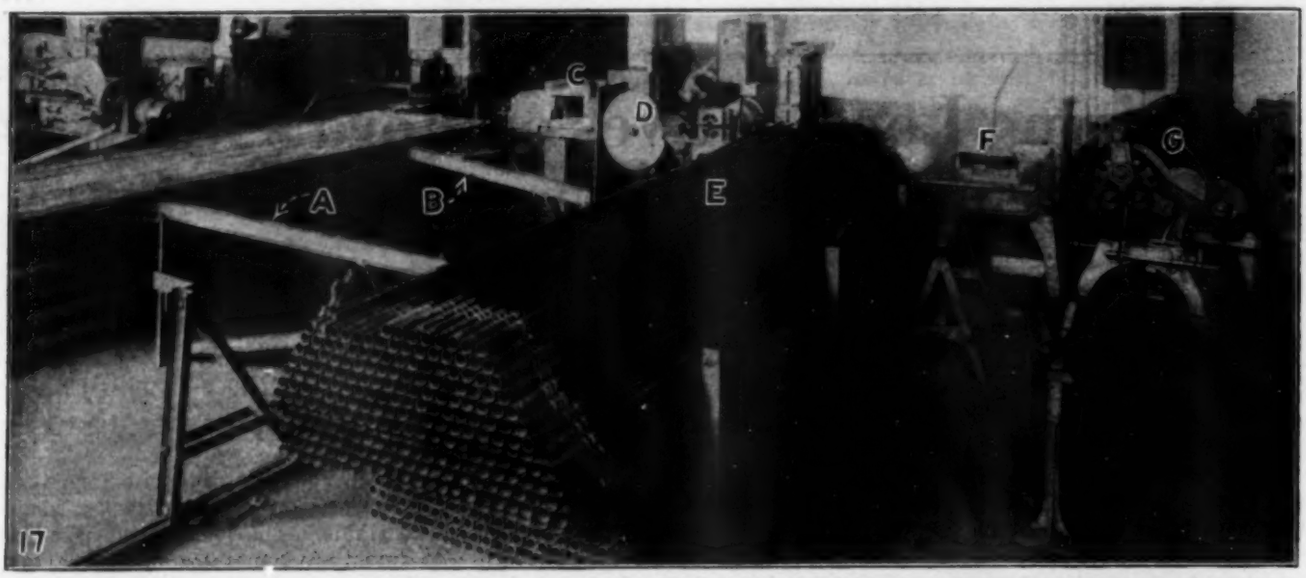
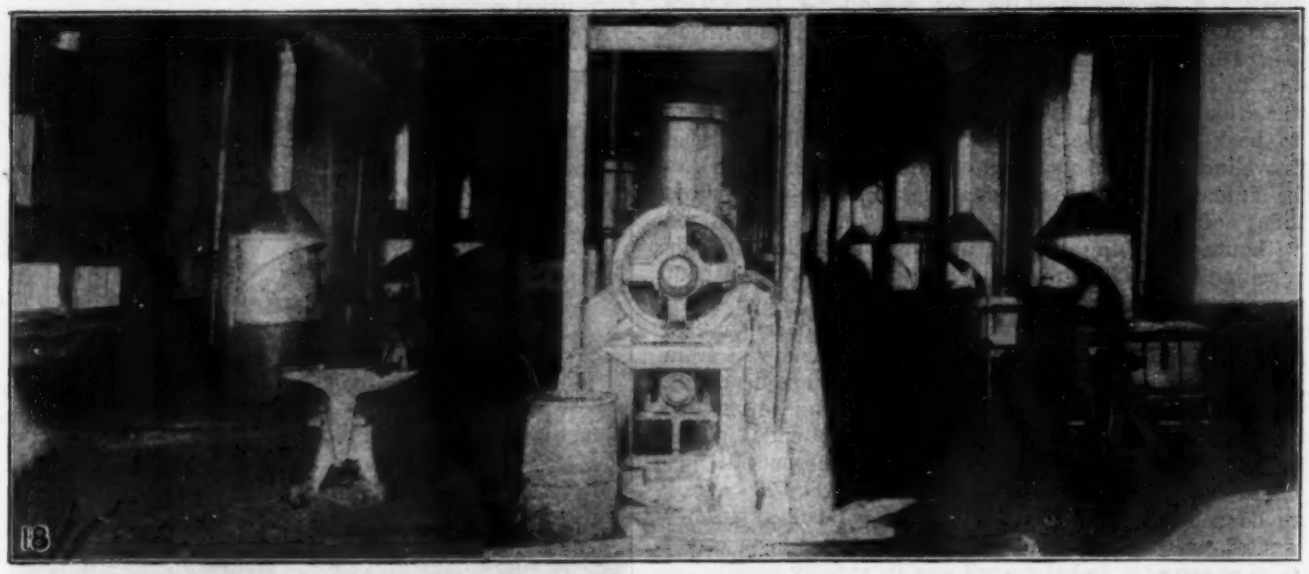


FIG. 16—COMBINED PLANER AND SLOTTER

In the same building, but separated by a partition, is the store room shown in Fig. 20. The shelves slant at a sufficient angle to make storage easy, and the substantial amount of stock carried avoids delay from lack of material. The store room is provided with monorail conveyors, and, as can be seen, is well lighted and the stock easily accessible. A detail of the store room showing the department where pipe fitting, which is so necessary around locomotives, is performed, may be seen in Fig. 21. This view shows the stock shelves even more clearly than the previous one. The railed platform makes it easy to reach any desired bin.





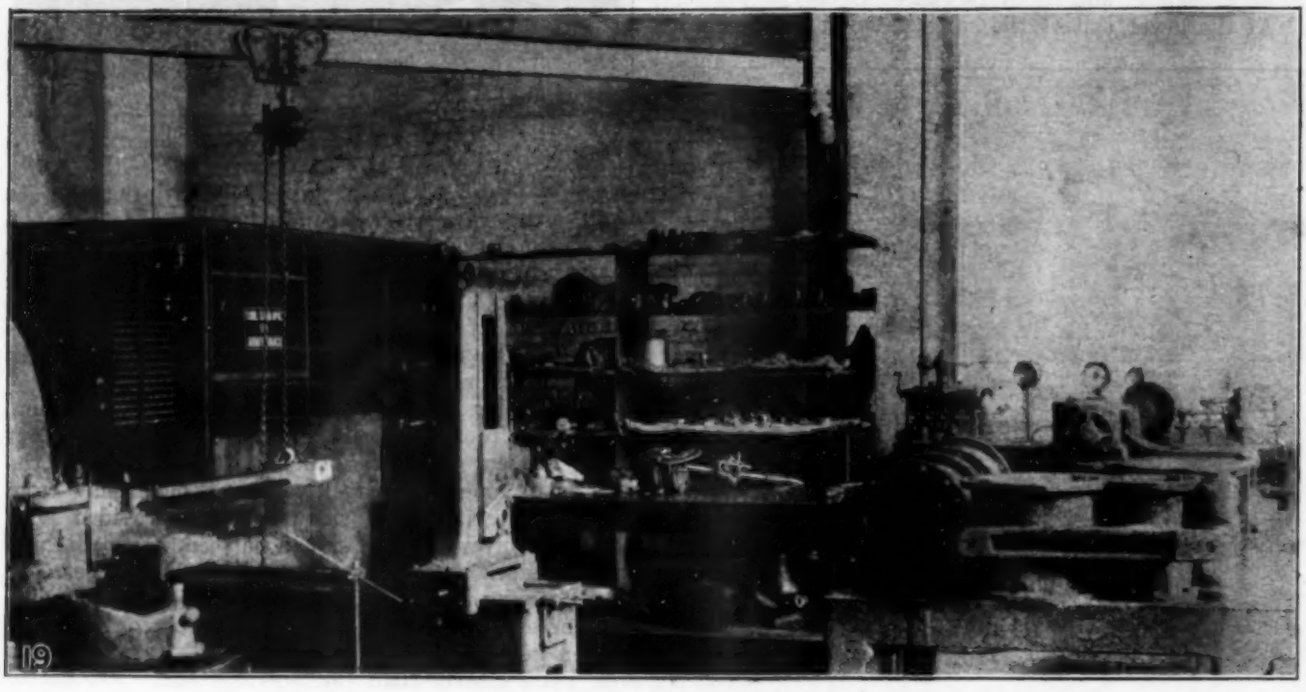
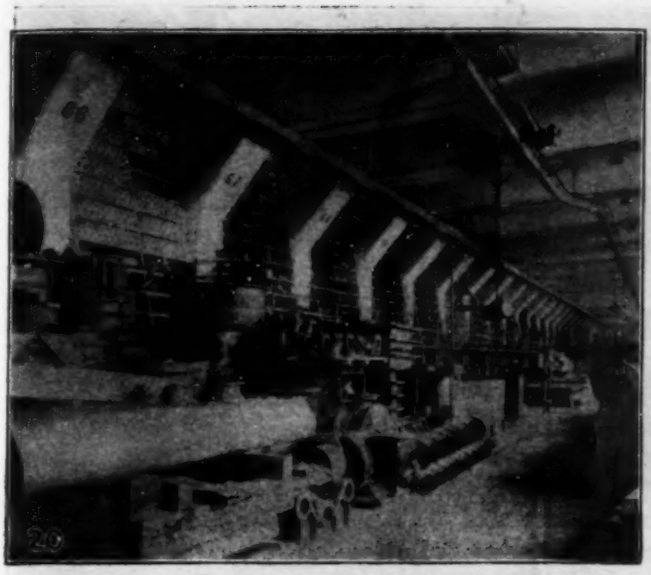
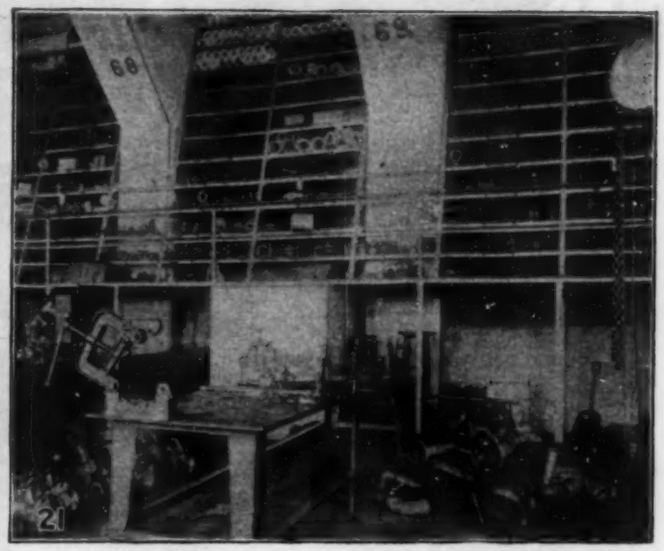


FIG. 17—BOILER FLUE DEPARTMENT. FIG. 18—FORGE SHOP. FIG. 19—AIR BRAKE DEPARTMENT





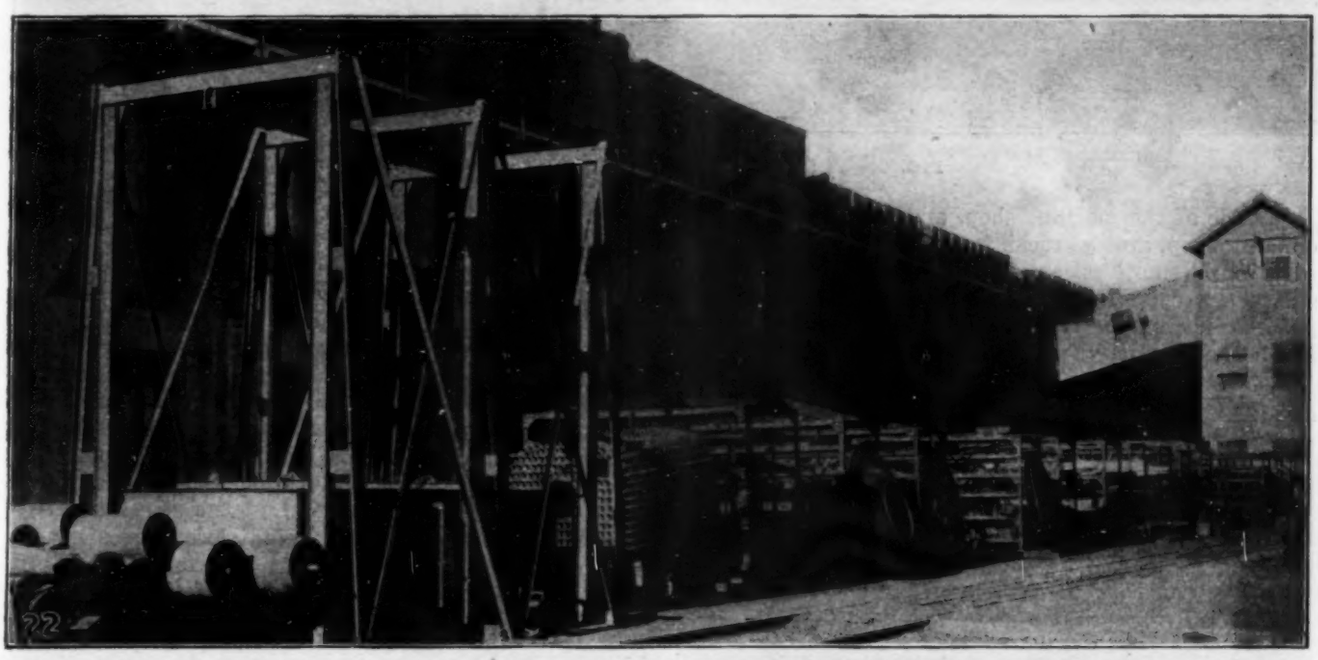


FIG. 20—GENERAL STORE ROOM. FIG. 21—PIPE FITTING DEPARTMENT. FIG. 22—OUTSIDE RACKS AND SODA TANK. FIG. 23—THE ERECTING SHOP

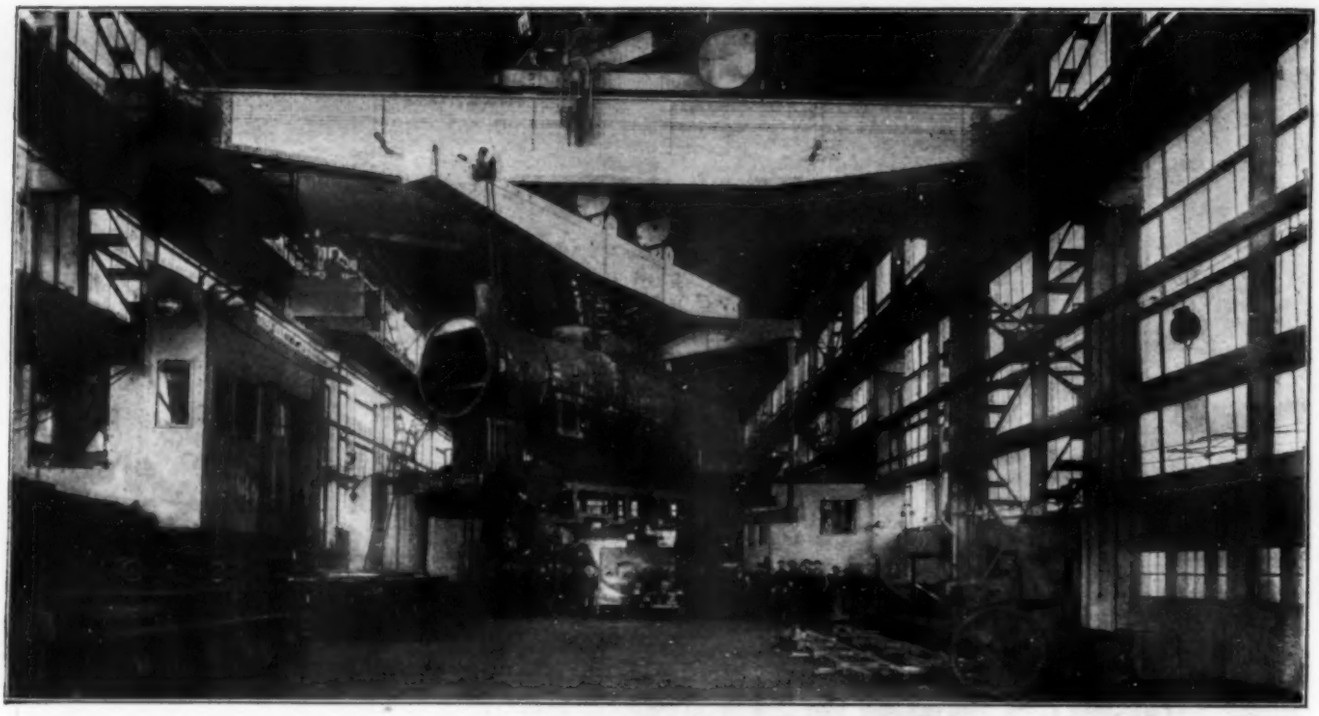


FIG. 24—TURNTABLE CRANE—125 TONS CAPACITY

Outside of the machine shop, and between it and the erecting shop, are the racks for storing the larger spare parts of locomotives, as shown in Fig. 22. The view shows a fire box, front ends and air tanks, and also gives an idea of the type of storage racks used. At the left is the soda tank, which is provided with a monorail and hoist. This tank is for cleaning parts of locomotives after they have been stripped, and before repairs are made.

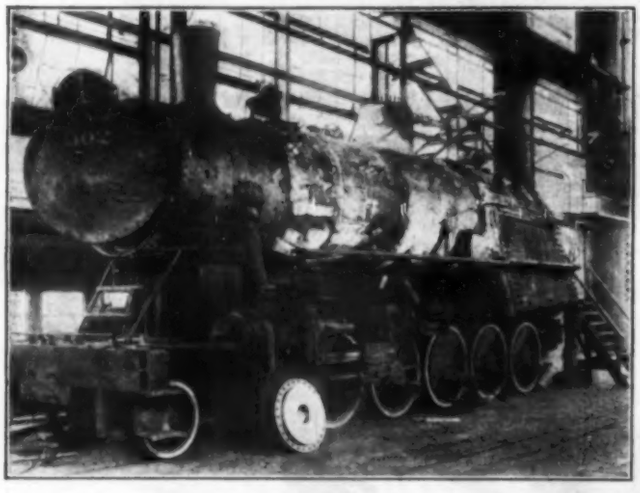


FIG. 25—STRIPPING A FREIGHT LOCOMOTIVE

Going to the erecting shop, which is approximately 75x500 ft., one is impressed with both the excellent lighting and the cleanliness of the whole shop, as shown in Fig. 23. The roof is high and permits one locomotive to be lifted over another, if necessary, and the height gives long windows on each side, making it about as light as any shop can be. In addition, there is a monitor in the roof for ventilation. This view shows the small overhead crane in the fore part of the shop and the larger one at the far end. At the left is a steam shovel which has just been rebuilt and supplied with a new steel cab.

One of the striking features in the erecting shop is the 125-ton crane for lifting locomotives and carrying them to any part of the shop. This crane, shown in Fig. 24, carries a huge beam having a sling at one end, which goes under the back end of the locomotive. The beam is suspended from a turntable at the top of the crane girders by which it can be revolved to any desired position. This is an extremely convenient arrangement and enables the locomotives to be placed in any desired position.

Fig. 25 shows one of the freight locomotives having ten drivers, which has just come in for overhauling. Fig. 26 shows the type of steel scaffolding used for working at any desired height on the outside of a boiler, and also shows the substantial wooden steps used in getting up to the fire box. It will be noted that this erecting shop has no pits, the locomotives being lifted off the driving wheels, which are rolled out of the way, and the locomotive supported on blocks.

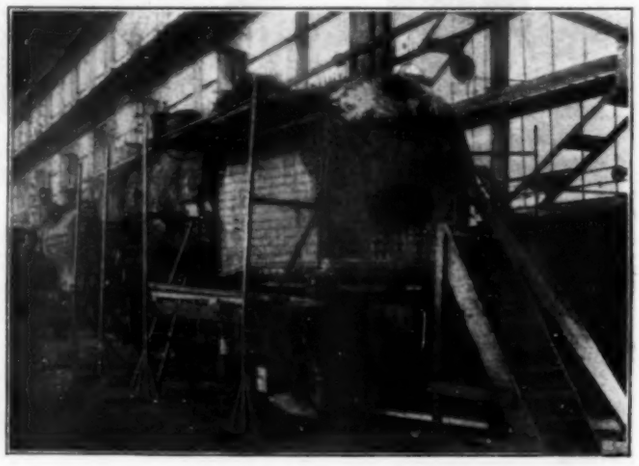


FIG. 26—STEEL SCAFFOLDING

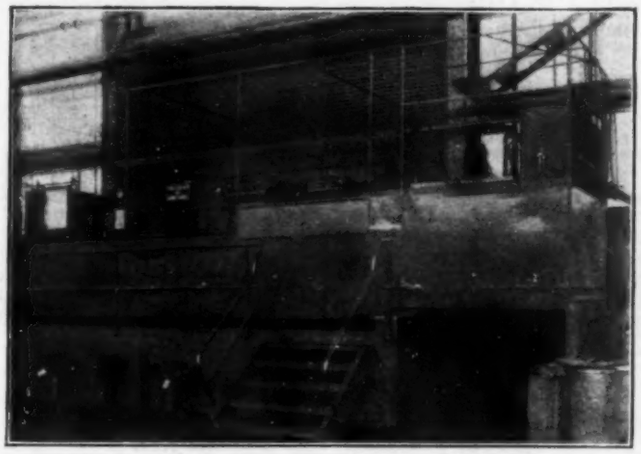


FIG. 27—THE TOOL CRIB

Another innovation is the tool crib shown in Fig. 27. The crib is elevated above the shop floor and is located midway of the length of the shop and against one wall. Here all the tools necessary are kept in good order, so that they can be checked out whenever needed.

As a sort of modern David and Goliath picture, Fig. 28, shows a Fordson tractor towing a locomotive tank into the shop for repairs. This tank and its locomotive had recently been turned over in the ditch and had just come in for a complete overhauling. These little tractors are proving extremely useful around a yard of this kind, especially where the track beds are flush between the rails, as in this case. Their use, perhaps typifies the new relationship between the railways and the manufacturer of automobiles.

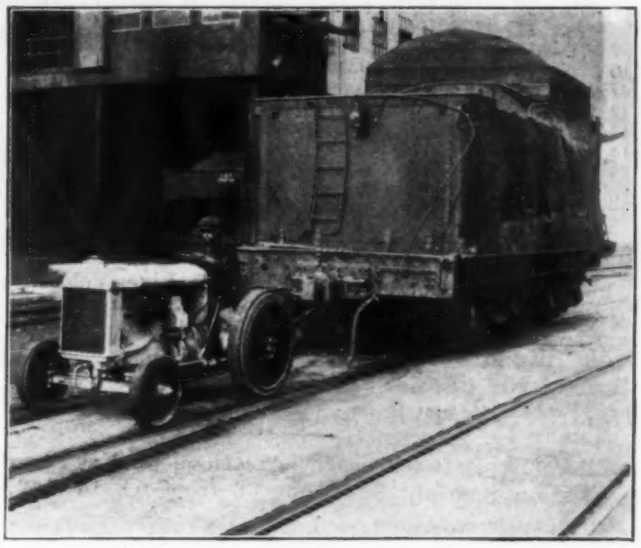


FIG. 28—UTILIZING THE TRACTOR

Proposed Standards for Herringbone Gears

THE Sectional Committee on the Standardization of Gears for which the American Gear Manufacturers' Association and the American Society of Mechanical Engineers are joint-sponsors recently presented to the sponsor bodies the following proposed standards for herringbone gears for general commercial use. The standards are printed in full for the information of the readers of *American Machinist* and to enable them to criticize and comment on the proposed standards to the sponsor organizations. All communications should be addressed to C. B. LePage, Assistant Secretary of the American Society of Mechanical Engineers, 29 West 39th St., New York.

Standard Tooth Form

1. *Pressure Angle.* The pressure angle in plane of rotation of gear equals 20 degrees.

NOTE: The angle of the cutting tool in the normal plane of the gear at the pitch is 18 deg. 31 minutes.

2. *Addendum* $= \frac{0.8}{P}$

NOTE: P = diametrical pitch in plane of rotation.

3. *Dedendum* $= \frac{1}{P}$

4. *Clearance* $= \frac{0.2}{P}$

5. *Whole Depth* $= \frac{1.8}{P}$

6. *Helical Angle.* The helical angle of teeth with axis equals twenty-three (23) degrees.

NOTE: The helix angle of a helical gear is the angle between the helix at the pitch diameter and a plane which contains the axis of the gear.

7. *Enlargement for Pinions.* The enlargement for pinions with 17 teeth or less is given in Table I.

NOTE (*a*): Enlargement for any given pitch is found by dividing the value given for 1 pitch for the number of teeth desired, by the pitch required.

NOTE (*b*): Calculate the outside diameter as usual, then add the amount of enlargement to the pinion and subtract the same amount from the gear. Use only when pinion has 17 teeth and less.

Gear-Blank Dimensions

8. *Pitch diameter* $= \frac{N}{P}$

NOTE: N = number of teeth.

9. *Outside diameter* $= \frac{N + 1.6}{P}$

10. *Active Face.* Minimum width of active face $= \frac{1.6}{P}$

NOTE: Total face is the width of the gear including the groove. Active face equals the total face minus the width of the groove.

11. *Groove.* The width and depth of groove in center of blank for gears cut with hobs at right angles to the axis of the gear are given in Table II. The letters *A*, *B*, and *C* in the table refer to the letters shown in the illustration.

12. *Groove.* The width and depth of groove in center of blank for gears cut with *single-threaded* hobs set at proper angle with axis of gear are given in Table III. The letters *A*, *B*, and *C* refer to the letters shown in the illustration.

13. *Groove.* The dimensions of groove in center of blank for gears cut by planing or shaping equal:

Width $= 1\frac{1}{4}$ in.

Depth $= \frac{1.8}{P}$ + suitable clearance.

TABLE I—ENLARGEMENT FOR PINIONS

No. of Teeth	Min. No. of Teeth in Mating Gear	Diametral Pitch 10	8	6	5	4	3½	3	2½	2	1¾	1½	1¼	1
7	28	0.1181	0.1478	0.1976	0.2364	0.2954	0.3382	0.3938	0.4726	0.5906	0.6762	0.7882	0.945	1.181
8	27	0.1064	0.133	0.1782	0.2128	0.2662	0.3046	0.3548	0.4258	0.5322	0.6094	0.7102	0.8514	1.064
9	26	0.0947	0.1184	0.1586	0.1894	0.2368	0.2712	0.3158	0.379	0.4736	0.5424	0.6322	0.7578	0.9471
10	25	0.083	0.1038	0.1392	0.1662	0.2076	0.2378	0.2768	0.3322	0.4152	0.4756	0.5542	0.6642	0.8302
11	24	0.0713	0.0892	0.1196	0.1428	0.1784	0.2044	0.2378	0.2854	0.3568	0.4088	0.4762	0.5706	0.7132
12	23	0.0596	0.0746	0.1002	0.1194	0.1492	0.171	0.1988	0.2386	0.2982	0.342	0.3982	0.4772	0.5962
13	22	0.479	0.6	0.806	0.958	0.12	0.1376	0.1598	0.1918	0.2398	0.2752	0.3202	0.3836	0.4792
14	21	0.0362	0.0454	0.0612	0.0726	0.0906	0.1042	0.1208	0.145	0.1812	0.2082	0.2424	0.29	0.3623
15	20	0.0245	0.0308	0.0416	0.0492	0.0614	0.0708	0.0818	0.0982	0.1228	0.1414	0.1644	0.1964	0.2453
16	19	.0128	.0162	.0222	.0258	.0322	.0374	.0428	.0514	.0642	.0746	.0864	.1028	.1283
17	18	.0011	.0016	.0026	.0024	.0028	.004	.0038	.0046	.0058	.0078	.0084	.0092	.0113

14. ***Horsepower Rating.*** For Pitch-Line Velocities up to 2,000 Feet per Minute.

$$Horsepower = \frac{33{,}000}{WV}$$

where $W = \frac{S}{2} PFYK$

(Formula; safe for wear when well oiled. For grease lubrication multiply by factor of from 0.8 to 0.62.)

W = load in pounds;
S = working stress (no speed) (see Table IV);
P = circular pitch;
Y = tooth-form factor from Table IV;
F = width of active face in inches; (for continuous contact of teeth, minimum face = 6 P);
K = speed factor from Table IV;
V = pitch-line velocity in feet per minute.

TABLE II—DIMENSIONS OF GROOVE

Diametral Pitch, Inches	*A* Inches	*B* Inches	*C* Inches	No. of Threads in Hob
10	7/16	1/16	1/8	5
8	7/16	1/16	1/8	4
7	1/2	1/16	1/8	4
6	1/2	1/16	1/8	4
5	1/2	1/32	1/16	4
4	1	1/32	1/16	4
3½	1	1/32	1/16	3
3	1¼	1/16	1/16	3
2½	1 5/16	1/16	1/32	3
2	1½	1/32	1/16	3
1¾	1½	1/32	1/32	3
1½	2 1/16	1/32	1/16	3
1¼	2 5/16	1/16	1/16	3

TABLE III—DIMENSIONS OF GROOVE

(Hob set at an angle to axis equal to helix angle minus angle of hob.)

Diametral Pitch, Inches	*A* Inches	*B* Inches	*C* Inches	No. of Threads in Hob
10	1/2	1/16	1/16	1
8	1/2	1/16	1/32	1
7	1/2	1/16	1/32	1
6	1/2	1/16	1/32	1
5	1 1/16	1/16	1/16	1
4	1 1/16	1/32	1/32	1
3½	1 1/16	1/32	1/32	1
3	1 1/4	1/32	1/32	1
2½	1 1/16	1/32	1/32	1
2½	2	1/32	1/32	1
2¼	2 1/16	1/32	1/32	1
2	2 1/16	1/16	1/16	1
1¾	2 1/16	1/16	1/16	1
1½	2 1/16	1/16	1/16	1
1¼	3 1/16	1/16	1/16	1

TABLE IV—TOOTH-FORM AND SPEED FACTORS

No. of Teeth	Values of *Y*	No. of Teeth	Values of *Y*	Values of *K*; $K = \frac{3{,}000}{3{,}000 + V}$			
				V	*K*	*V*	*K*
12	0.078	27	0.111	0	1.000	1,100	0.731
13	0.083	30	0.114	100	0.968	1,200	0.714
14	0.088	34	0.118	200	0.938	1,300	0.697
15	0.092	38	0.122	300	0.909	1,400	0.681
16	0.094	43	0.126	400	0.882	1,500	0.666
17	0.096	50	0.130	500	0.857	1,600	0.652
18	0.098	60	0.134	600	0.833	1,700	0.638
19	0.100	75	0.138	700	0.811	1,800	0.625
20	0.102	100	0.142	800	0.789	1,900	0.612
21	0.104	150	0.146	900	0.769	2,000	0.600
23	0.106	300	0.150	1,000	0.750	.....	.....
25	0.108	Rack	0.154	....	.....	.....	.....

Values of *S*

Chrome-nickel heat-treated steel, (S.A.E. 3245)	30,000
50 C forged steel (S.A.E. 1045)	25,000
30 C forged steel (S.A.E. 1030)	20,000
Cast steel, A.S.T.M. class A	15,000
Gray iron	8,000
Bronze, 88-10-2	8,000

Insurance Reserves and National Progress

In a brief report under the above title issued by the Chamber of Commerce some valuable information is given to policyholders. The policyholder pays his premiums to the insurance company. As required by law, a certain portion must be retained as a reserve. The policyholder is vitally interested in the security of these reserves from which claims will be paid. Various states have therefore held that they are affected by a public interest, and their investment should consequently be regulated. Accordingly, most states have prescribed the type of investments which insurance companies are permitted to make.

The reserves of insurance companies are not idle. Insurance companies, as well as savings banks and individual investors, are an important source of capital which makes the great projects of the modern age possible. The assets owned by all types of insurance carriers in this country were estimated for 1920 at ten and one-half billion dollars. Approximately 25 per cent of these assets were invested in high-grade mortgages and 55 per cent in stocks and bonds. Thus, the policyholder's premiums, paid to the insurance companies, not only provided protection, but also contributed to the financial and industrial growth of the country.

Insurance investments assist the farmer to make improvements or plant a larger acreage. They aid the householder in constructing a more attractive and comfortable home.

Oscillations and Fatigue of Springs

By JOSEPH KAYE WOOD
Engineer, Western Electric Co., Inc. and A. T. & T. Co.

The fourth article—Damping due to external resistances — Repeated stresses that cause fatigue—Static and kinetic material indexes

THERE ARE MANY ways in which the oscillations of a spring may be damped from an external source other than by air interference which will be treated separately. These resistances may be classified under two headings, those which are proportional, or nearly so, to the velocity such as the viscosity type, and those which are constant, or nearly so, such as the solid friction type. The former are covered by the same laws as for internal resistance when pure viscosity is considered. The resultant damping, when it is small, is expressed graphically by the space-time curve in Fig. 10 of the preceding article.

With constant resistance such as solid friction, the amplitude does not decrease in a geometric progression like the viscosity type of resistance, but decreases in an arithmetical progression. The space-time curve expressing this law graphically is shown in Fig. 12, which is drawn readily by projecting the intersection of a semi-circular spiral and a uniformly revolving vector. The semi-circular spiral is drawn by connecting semi-circles whose diameters increase by a constant amount, say τ, which corresponds to the logarithmic decrement μ in the viscosity type of damping. In this case, for all values of τ, the period is exactly constant.

The External Viscosity Type of Damping

Examples of the external viscosity type of damping are: The use of liquid dashpots to dampen the oscillations of automobile elliptic springs; the complete damping of the natural free oscillations of oscillograph vibrators by means of a viscous liquid (such as castor oil) so that they will be "dead beat"; and in general, springs submerged in oil. In some cases, the solid friction type of resistance would be represented by the space-time curve for the viscosity type of resistance as, for example, where the normal pressure of contact in solid friction varies directly with the velocity which occurs when springs are actuated by certain types of cams. Finally, another case coming under the same law would be where a solid material of high elastic hysteresis is used to dampen or absorb the oscillations of a spring, as in the case of buffers.

In the last case, if a designer wishes to have the entire energy of a blow due to the release of a deflected spring absorbed in order to eliminate noise and undue wear, he uses metal as highly resilient as possible, but with a very low elastic hysteresis. Of course, if the buffer is so situated that it can dissipate the imparted energy by vibrating freely, a low hysteresis would be advisable, but in a particular case I have in mind, the buffer was not free to vibrate and the allowable deflection was small. If energy is to be dissipated in another material so as to eliminate noise, it must be manifested either by damped vibrations of low frequency and large amplitude if such be allowed by the design, or by little or no vibration and a large elastic hysteresis. It is true that such vibrations break down the buffer material sooner and that materials of large hysteresis such as rubber, leather and certain kinds of wood are more liable to deteriorate than resilient metals, but the desired purpose is accomplished.

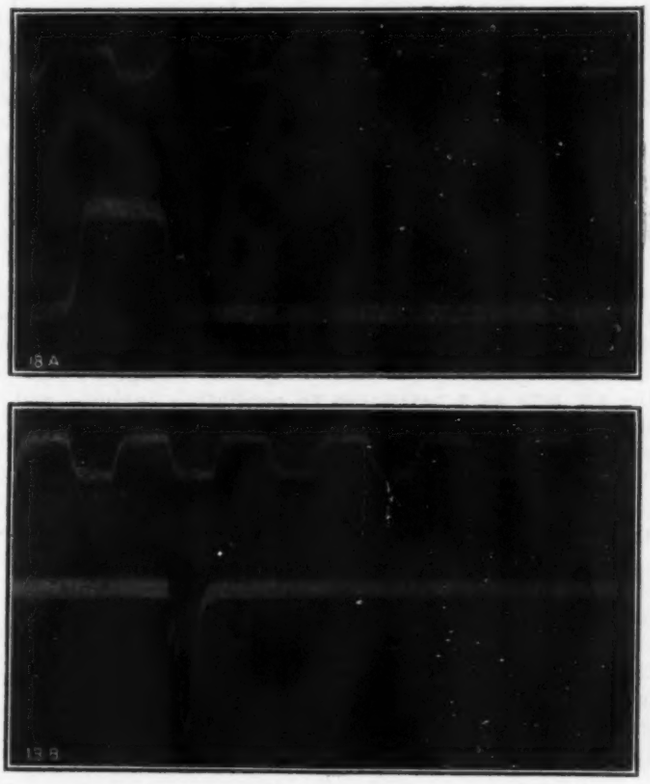


FIG. 18A—OSCILLOGRAM OF THE MAKING AND BREAKING OF A CURRENT WITHOUT CHATTER. FIG. 18B—OSCILLOGRAM OF THE MAKING AND BREAKING OF A CURRENT WITH CHATTER

Examples of the constant type of resistance or solid friction are: Rubbing between helical springs and their guide rods; and the friction between the blades of a leaf spring, a big factor in automobile elliptic springs. In a recent report on railroad coaches in England, leaf springs were recommended in lieu of helical springs because of the self-damping action of the former.

A typical problem which involved many of the above principles, was presented to the writer not long ago.

It required the making and breaking in $\frac{1}{60}$ sec. of a 1,000-volt circuit in which 14 amperes were flowing. Furthermore, an oscillogram of this operation was required to be like that shown in Fig. 18. The method used was a mechanical one, similar to that shown schematically in Fig. 19. The viscosity of the transformer oil, the design of the springs *A* and *B* and the buffer *C* were important factors in the development work. At one stage it was found that damping the

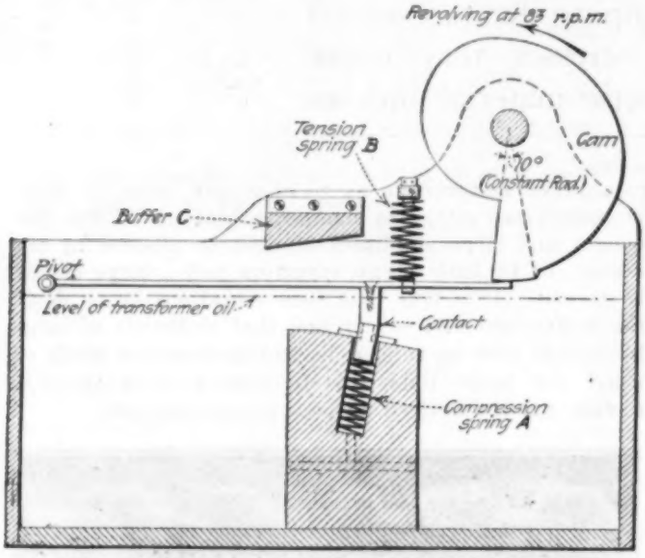


FIG. 19—A TYPICAL PROBLEM IN OSCILLATION AND DAMPING OF SPRINGS

spring *B* by wrapping one layer of rubber tape around it, eliminated the chatter such as Fig. 18b illustrates.

The oscillations of a spring may be maintained for a greater length of time in a vacuum than under atmospheric pressure, where the spring imparts a wave motion, and consequently some of its imput energy to the adjacent air by which it is quickly damped. Thus the air acts as a resistance to oscillating springs, and it has been shown by Bessel's researches that this resistance is very nearly proportional to the velocity. The space-time curve, therefore, for this type of damping is that illustrated in Fig. 10 of the previous article, showing the viscosity type. The magnitude of this type of damping depends largely upon the size and shape of the face of the spring opposing the oscillating motion, because the size and shape determine the size of the column of air set in motion, which in turn determines the amount of imput energy lost to the air at each oscillation; that is, the rate of damping would be greater for a telephone transmitter disk than for the tuning fork which was described in the second article.

Summary of Three Resistances

The internal and air interference types of resistances are always present in the case of oscillating springs and both types are approximately expressed by the space-time curve shown in Fig. 10. The rate of dying out of the oscillations is determined by the derivative $\frac{ds}{dt}$ (tangent) for the particular point in question. Some types of external resistances are also expressed by this law. The solid friction type of external resistance is expressed by the space-time curve shown in Fig. 12, also of the previous article. The rate of dying out is constant for any one particular case and is equal to the tangent of the angle which the dotted line makes with the horizontal axis of the curve.

Up to this point we have been considering springs which oscillate freely, except in places where reference was made to fatigue failure. We come now to the part of our discussion wherein we link the oscillating characteristics of springs to its practical applications in mechanical apparatus. For example, if a cam revolving at high speed actuates a spring or the sprung part of a mechanism whose free period is greater than that corresponding to the speed of the revolving cam, then the spring will not follow the cam; that is, it will miss at certain intervals. If electrical contacts are involved, chattering due to an improper free period or lack of damping, may occur. Then again, an oscillating spring or string may be required to register the impressed oscillations of another vibrating medium, in which case the free oscillations of the spring must be entirely damped or "dead beat."

On the other hand, a certain imput of energy may be regulated to have a period equal to the free period of the spring which does the regulating. This principle is involved in a very ingenious device in the form of an electrical tuning fork or spiral spring with a balance wheel, which causes a contact to be closed momentarily during every oscillation which in turn causes a magnet to give a short impulse of a certain intensity to the oscillating spring. In this way just enough energy is supplied to overcome the damping resistance, resulting in the maintenance of oscillations at the initial amplitude and free period of the spring. The space-time curve for this series of oscillations would be the sine curve which Fig. 11 shows in the preceding article.

There are many examples which may be mentioned in connection with impressed oscillations, but one case which is of extreme importance is the relation of impressed or forced oscillation to the fatigue phenomenon of metals. It is well known now that a metal stressed repeatedly (impressed oscillations) many times (millions), will fail at a lower nominal stress value than when the metal is stressed only once (as in a static test) or a few times. Thus we are led up to the matter of fatigue failure of springs.

Definitions of Fatigue

The definition of the word fatigue as given in Merriman's Mechanics of Materials is: "Fatigue is the *loss* of *molecular strength* under stresses often repeated." In a recently presented report, Bulletin No. 124, published by the University of Illinois and entitled "The Investigation of the Fatigue of Metals," by H. F. Moore and J. B. Kommers, fatigue is defined as "the *action* which takes place in a material causing failure after a large number of applications of stress." The former definition implies that fatigue is the *result*, presumably in pounds per square inch, of an internal action caused by an external action, that is, repetitions of loads, while Moore's definition gives the name fatigue to the internal action.

No doubt the difference here and in general is due to the borrowing of a word which defines a certain condition in the human body and is recognized by certain senses to cover a phenomenon in metals which is not recognized by the same senses. The adoption of the word, however, has a logical basis because in the broad sense fatigue has to do with a weakening after many applications of stress. This definition is sufficient for a general understanding and it is not really essential to

be specific in connection with the broad name fatigue.

Specifically, the problem in connection with fatigue phenomenon is to determine the relation between the nominal value of a repeated stress and the number of such repetitions necessary to cause failure. The rate at which these repetitions of stress are applied affects this relation, but it was found by Moore that rates below 2,000 reversals of stress per minute on the rotating beam type of machine did not vary the results appreciably. This fact is probably due to a condition in which the rate of internal damping in the specimen was decidedly greater than that corresponding to the frequency of the impressed oscillation, or the speed of the testing machine. By using a constant speed of 1,500 r.p.m. he invariably obtained an *S-N* curve (S = value of stress; N = number of repetitions) for the steels tested of the general shape shown in Fig. 20. The stress corresponding to the horizontal part of the curve is termed the "endurance limit" below which the material will stand any number of repetitions at least up to 100 million.

Existence of True Proportional Limit

If such a limit exists for other spring metals besides the steels tested, it will prove to be a very happy condition indeed, for the reason that the Stroymeyer tests made on the same steels tested in the rotating beam machine showed that there is a rapid rise in temperature at this endurance limit which, as pointed out in the previous article, indicates early slippage in favorably situated crystals; that is, the existence of a true proportional limit.

The other evidence pointing to the existence of this true limit is the result of the fatigue tests made by H. J. Gough of the engineering department of the National Physical Laboratory and reported in the August 12, 1921 issue of the *Engineer*. In these tests it is shown that the proportional limit, as determined by measuring the deflections for the given stresses while the specimen is being put through rapid repetitions of these stresses, is approximately equal to the endurance limit as shown by the *S-N* curve. The true proportional limit is shown up in this test because the stress-strain co-ordinates follow the line *A* in Fig. 14 of the previous article, instead of the dotted line due to the oscillations being so rapid. This test would tend to show the knee preceding the viscosity lag, thus giving a lower limit of proportionality.

Finally, Francke in his extremely sensitive static deflection measurements shows the existence of a true proportional limit which for the steels tested by Moore is remarkably close in value to the endurance limits. Provided a metal is practically free from mechanical flaws and foreign intrusions the writer sees no reason why the endurance limit and the true proportional limit should not be the one and the same stress value.

It was previously stated that a metal having similar crystals should have a true proportional limit very nearly equal to the proportional limit as determined by the ordinary tensile testing machine. We, therefore, would expect the endurance limit of such metals to be approximately equal to the ordinary proportional limit, and such was the case with Armco iron and pearletic steel tested in Moore's investigation. Thus we see that the real measure of the fatigue quality of a metal is the ratio of the endurance limit (or its equal, the true proportional limit) to the ordinary proportional limit.

There is one possible factor which tends to give a higher or lower endurance limit, all other things being equal, and that is the method of stressing. In bending, the maximum stress exists only at the clamping end and varies with the distance from the neutral plane and from the clamped end. In twisting (helical springs) it does not vary to such a great extent; that is, the average stress value rather than the maximum stress value may be the more correct figure to use in fatigue testing. In the writer's article on "General Methods of Spring Design" which appeared in Vol. 55 of *American Machinist*, the ratio between the average and maximum stress for different types of springs was referred to as the "economy index." This factor would have a greater effect in metals that are not so free from microscopical flaws, which flaws are more liable to occur in the form of tool marks, scratches and sharp corners at the surface where the maximum stress occurs.

If a well defined endurance limit, therefore, exists for spring metals in general, we may speak of two kinds of material indexes, which index is a measure of the safe range of deflection for a given form and size of spring. (Reference is made to the writer's former articles on springs appearing in *American Machinist*). We may have a static material index equal to a constant times the ratio $PL \div E$, and a kinetic material index equal to the same constant times the ratio $PL_k \div E$. The symbol PL is the ordinary proportional limit determined by a static test and good for static working loads or repeated loads within say one million applications. The symbol PL_k is the true proportional limit determined by a kinetic test, that is, the endurance limit test, and is good for kinetic working loads of more than say 10 million repetitions. The symbol E is the modulus of elasticity for the material.

However, very little or no fatigue tests have yet been made on metals for springs of small sizes such as wire and sheet stock and until these tests are made it will not be safe to assume endurance limits obtained from tests made on similar metals when made up into speci-

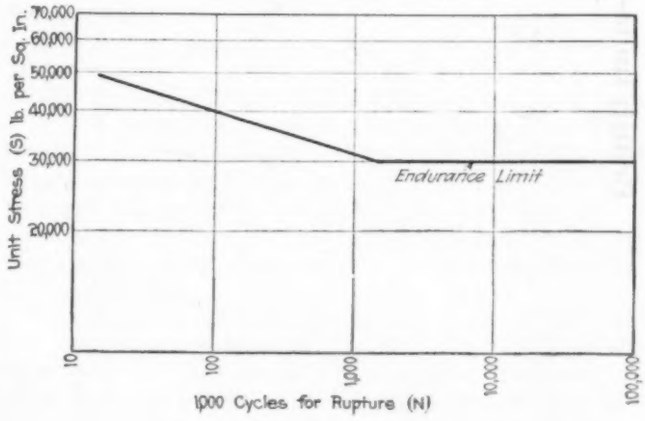


FIG. 20—S-N DIAGRAM

Taken from Prof. H. F. Moore's Report, Bulletin No. 124. Diagram is for 0.93 carbon steel, rotating beam test, logarithmic ordinates and abscissas.

mens of relatively large dimensions. In these proposed tests, factors such as accurate measurement of specimens, rate of repetitions of stress, clamping pressures, stress calculations and measurements of temperature changes become very important. Probably the best way to test the sheet stock would be to deflect a bank of flat springs by means of an impulse motor driven by an electrical tuning fork. Possibly the wire stock made up into helical springs could be tested in the same manner.

TABLE XX

British India—Imports of Metal Working Machinery

Country of Origin	1912–13 £	1913–14 £	1914–15 £	1915–16 £	1916–17 £	1917–18 £	1918–19 £	1919–20 £	1920–21 £
United Kingdom	7,624	8,208	6,210	1,994	3,534	1,446	2,276	55,127	1,177,555
Ceylon	.....	56	.....	.....	.....	.....	.....	.....	140
Canada	.....	.....	.....	.....	.....	.....	.....	.....	51
Straits Settlements	1,015	.....	.....	.....	.....	171	.....	100	.....
Hongkong	.....	.....	.....	.....	.....	.....	608	.....	.....
Australian Commonwealth	260	.....	.....	.....	.....	.....	.....	.....	.....
Total British Empire	8,899	8,264	6,210	1,994	3,534	1,617	2,884	55,227	1,177,746
Sweden	.....	.....	.....	.....	.....	.....	.....	268	9,143
Norway	.....	.....	.....	.....	.....	.....	.....	.....	1,242
Denmark	.....	.....	.....	.....	.....	.....	.....	.....	1,906
Germany	563	64	153	3	.....	.....	.....	.....	6,572
Holland	.....	.....	.....	.....	.....	.....	.....	.....	2,186
Belgium	.....	.....	.....	.....	.....	.....	.....	.....	186
France	.....	.....	.....	.....	.....	.....	.....	.....	3,166
Switzerland	.....	.....	.....	.....	.....	.....	.....	.....	1,530
Italy	.....	.....	.....	.....	.....	.....	.....	.....	2,038
Japan	.....	.....	.....	.....	256	31	166	9,014	8,507
United States of America	689	1,266	468	2,496	5,111	3,070	1,428	20,050	333,524
Other Foreign Countries	18	137	8	.....	.....	.....	.....	.....	.....
Total of Foreign Countries	1,270	1,467	629	2,499	5,367	3,101	1,594	29,332	370,000
Amount Taken by the Importing States									
Share of Bengal	2,533	962	591	596	87	3	.....	2,335	754,431
Share of Bombay	144	375	668	8	.....	.....	119	60,565	520,066
Share of Sind	2,911	2,371	3,006	1,990	404	231	2,143	7,241	66,400
Share of Madras	2,637	1,611	790	.....	.....	.....	732	6,277	13,099
Share of Burma	1,944	4,412	1,784	1,899	8,410	4,484	1,484	8,141	193,750
Total of Imports	10,169	9,731	6,839	4,493	8,901	4,718	4,478	84,559	1,547,746

NOTE. Complete Indian statistics for the fiscal year ending March 31st are not yet available. The Indian fiscal year begins April 1st and ends March 31st.

TABLE XXI

Argentine Republic—Imports of Lathes

"Tornos"

Country of Origin	1910 Kilos	1911 Kilos	1912 Kilos	1913 Kilos	1914 Kilos	1915 Kilos	1916 Kilos	1917 Kilos
Germany	109,955	89,820	106,144	79,895	62,095	2,697	.....	.....
Austria-Hungary	26	.....	.....	.....	33	.....	.....	.....
Belgium	59,556	19,236	7,443	12,313	14,584	.....	.....	.....
Spain	.....	.....	.....	.....	.....	624	646	1,780
United States	8,989	8,332	9,528	15,272	7,220	12,617	63,586	29,755
France	189,640	147,956	123,234	126,604	48,564	213	1,367	143
Italy	.....	7,827	845	368	.....	245	.....	.....
Netherlands	.....	310	211	2,492	226	169	.....	.....
United Kingdom	60,373	63,704	51,371	59,753	26,160	6,551	23,123	4,792
Sweden	.....	30	.....	644	31	12,013	17,333	1,996
Switzerland	25	195	339	.....	.....	.....	.....	.....
Denmark	.....	475	12,084	.....	.....	.....	500	.....
Brazil	.....	.....	.....	.....	.....	8	.....	.....
Uruguay	.....	.....	565	.....	52	.....	.....	.....
Chile	.....	.....	.....	.....	.....	.....	7	.....
Norway	.....	.....	.....	.....	.....	5,130	.....	.....
Total of Imports	428,564	337,885	311,764	297,341	158,965	40,267	106,562	38,466

Where the "Overhead" Comes In

By H. T. LUNDQUIST

The various factors of cost beyond labor and material—Costs that eat up apparent profit on repair jobs—The difference between wages and sales price

TO A CERTAIN shop came an order for a repair part that was not in stock and which belonged to an old, discontinued model. It was decided to make only one in the repair division. It was a simple piece and when the workman had finished it and turned it over to the inspector he said, "It took me just 50 minutes to make that piece. A chunk of steel like that don't cost the company much. I bet they will charge about two dollars for it. Look at the money they are making on me."

This happened at a time when only the very best workmen received the top notch wage of fifty cents an hour, and John was one of the very best mechanics about the place, but he was weak in shop economics. To him it seemed quite evident that while he was making fifty cents the company was making one dollar and a half. This might seem exaggerated, but is it not true that the average workman has about as poor an understanding of shop economics as our friend John had?

The workman knows that he gets a fixed amount of pay for a fixed amount of time or quantity of work. He also realizes that the material on which he is working must cost something, but beyond that he has only a vague idea about the company's expenses. He has heard about overhead, to be sure, and he is hearing more about it now than ever before, but just what it is, or how much it amounts to is not clear.

Salaries in the Front Office

Up in the front office are a lot of big guys drawing large salaries, and ever so many fellows holding down white collar jobs, and bunches of girls wearing silk stockings. He knows that all these must be paid, but he does not know what they do, so they seem a rather useless expense. "Overhead," of course, but why should he bother about it.

How was John to know that up there in the office someone had been paid by the company for buying that particular piece of steel on which he had been working? There were letters written and letters received, read and filed. The railroad company charged for hauling it, and someone had to be paid for unloading it from the freight cars. Someone had to check it up against the invoice, and perhaps inspect it. And, in the nature of things, checking and inspecting cost money.

The invoice had already been received in the office, sent to the receiving department, and now someone had to take it back to the office again. Then the stock had to be trucked to the storage and put on its proper rack. By this time the inventory department had been notified, and records were made to the effect that so much material had been received in the storeroom. And all these people had to be paid out of that dollar and a half the company was making.

But the story has scarcely begun. The storage space which housed the material represented a certain capital and would be a loss to the company unless the stock paid for it. The money represented by the stock itself was also lying idle on the racks, and would be dead capital unless the company could sell it for more than it had cost. Now it happened that someone broke a part manufactured in this particular plant, many years ago. A letter ordering said part was received in the office, where no one does any work.

Where the Repair Cost Starts

Someone read that letter and sent it to the repair parts office where it again was read and action taken. So those people in the office are not quite a useless lot. Then some sort of machinery had to be set in motion to place the order for the single piece in the factory. An order had to be sent to the storage requesting so many inches of steel be sent to the repair division. The sleeping, useless person in the inventory department was disturbed again. Certain records had to be made to the effect that so much steel had been removed from the store room. The cost department was also intruded upon, for someone had to calculate the value of that piece of steel.

It is not in the nature of steel bars to walk around all by themselves so someone had to take it to the repair division. There was a delay on the way, however. A long, heavy bar had to be taken to a saw where the proper length was cut off. Someone paid by the company ran that saw, and used a machine that had cost the company cold cash. He wore the saw to some slight degree, and the operation consumed a certain amount of oil. Perhaps our friend John had never thought of that.

Let us leave the long bar to get back on its rack the best it can and follow the piece in which we are interested. It had landed in the repair division. An order had also been received there requesting that the piece be made. One of those good-for-nothings in the office had made out the order. The clerk in the repair division went to the files to get a blueprint, but finding none, he telephoned to the blueprint room for one. In the blueprint room are long rows of files containing tracings and prints. All those files are paid for by the company, but this cost vanishes to nothing when compared to the cost of what they contain. It is all cold cash standing idle. But there was no print of this old part in the blue print room either, so one had to be made.

Here then was an order to make something, a blue-

print to go by and a piece of steel to make it of. The rest was easy. The foreman of the repair division gave the piece of steel and the blue print to John and said, "Make one like that, John." John went to the time clock and rang in on the job. A perfectly good time card was used, and a time clock, also the company's property played its part. Besides, it had taken a fraction of the clerk's time but that's nothing, he has to be there anyway.

John proceeded to work, but he did not think about the fact that he was running a machine that had cost the company money and was steadily there representing so much capital. John also used a drill, a reamer and a plug gage on the job. Of course the machine would have to run if it was to be of any use. The countershaft was running and so was the line shaft. The belts were in fine condition for the millwright has just fixed them. It had to run, for over head was an electric motor driving the whole works.

Every morning the boss went over to a box and pulled a lever, and the whole conglomeration of shafts, pulleys and belts began to hum. That was all John saw. He could not see the current that went into the motor, and he had not even paid much attention to the wires that led to it. No doubt he knew about it, but he had never given a serious thought to the fact that there was a generator on the other end of that wire, that there was a steam engine pulling the generator, and in turn a boiler to furnish the steam. A thought as to how much coal the fireman had to put into that boiler to keep the lathe running had never entered John's head.

It was warm and pleasant in the shop; it was cold and gloomy outside. Somewhere there was a boiler to keep the factory warm and there must have been some means of getting the heat to where John worked. There were numerous lights glowing brightly high above John's head. How much had they cost, how much had the wiring cost, how much current did they use? In short, how much did it cost to keep the factory lighted and warm? These were questions about which John had never worried.

Running His Own Shop

Fifty minutes were gone and the job was finished. John would get fifty cents or so, and the company would make a dollar and a half. What a shame to exploit a man in such a way! If John only had money enough to start a little shop of his own he could make four times more. It was so easy to figure out. He handed the job to the inspector who checked it up and found it O. K. Meanwhile, John had rung out on the job. Fifty minutes it had taken, sixty perhaps, if one counts the time it took to ring in and out and have a short conversation with the time clerk about last night's bowling match.

The time clerk was in the habit of sending those cards to the time office where John's pay for his work was calculated and forwarded to the cost department. Here this labor cost was added to the material cost and on top of that went some 300 percent overhead, but John did not know about that. It was none of his business at all. The first thing we know the finished article bobbed up in the shipping room. Here someone wrapped it up in a neat package. There was an order to address a piece bearing such and such a number to such and such a person.

The package had to be taken to the post office to be sent off by parcel post. This took some stamps, but why should John worry about that? Those good for nothings up in the office were not quite done with the job yet. The order had to be closed and a bill had to be made out and mailed. There went another stamp. Every morning when John goes to work he enters a large building, there are several large buildings in fact. John did not consider the money it took to purchase the ground on which they stand.

John knows that there is something called overhead, but he has never learned what a complex monster it is. The buildings are there and they belong to his rich employer who is exploiting him. Once every year that employer of John's is figuring out how to pay his taxes. There is the fire insurance too, and interest on bonds. Somebody is talking about depreciation, but this is deep stuff and we cannot expect John to know about that. All he knows is that when he is making fifty cents the company is making a dollar and a half.

The Job That Was Too Big for the Planer

By F. M. A'Hearn

An article that recently appeared in the *American Machinist* describing the planing of a job that was too large to go between the housings of the planer reminded me of a similar experience in the days of long ago when drawings and blue-prints were not so much in evidence as they are now. The trouble came about as usual, from lack of definite instructions.

A rectangular plate was wanted upon which to lay out work and as there was no special reason for definite dimensions, it was decided that it was to be about "so" long and as wide as the big planer would handle it. John, the patternmaker, was accordingly called over and told to make a pattern of the length, thickness and section decided upon and to get his dimension for width from the planer. "And be sure to leave stock to finish on both edges," said the boss.

Now John was a cautious soul and had his own ideas about finish. Whenever he was told to leave a certain amount of "finish" on a pattern he usually added a little on his own account, "to be sure." Anyway, in this case he left all the finish that could be desired, and then some; that was how the trouble came about.

When the casting was hauled in from the foundry and one of the machinists was awarded the easy looking job of planing it, he had visions of many pleasant hours spent in watching the old planer nibble its way across the face of the plate. He hurried to his task, only to be disagreeably surprised when he discovered that the casting was just about one inch wider than the distance between housings of the planer.

When the foreman was advised of the condition of affairs he sent for John, while the rest of the boys edged nearer in order to be present at the ceremony that was expected to take place. The boss blamed John for the "bull," and John, in self-defense, protested that the boss had got just what he ordered—if he would have the "finish" planed off the edges the casting would go through.

The longer the boss looked at the plate the more certain he became that it could not be planed in an ordinary way unless by chipping sundry clearance spots along the edges and by using a long extension tool he could plane a couple of feet at a time and eventually get the whole length of the casting narrow enough to pass the housings.

About this time the boss blacksmith wandered in. Upon being told the cause of all the row, he innocently inquired: "Why not set the casting up at an angle and swing the head over to correspond?" "*Just* what I was going to suggest," responded all the boys in unison, while the foreman went them one better by declaring that he had planed dozens of such pieces in that way.

And that was the way it was done. Although I have spent many years in shops since that time I have never seen another job handled in the same way.

Conditions in Denmark

BY CHRISTIAN LARSEN

After an absence of more than 20 years the writer returned to his native country, Denmark. The impression received after stepping ashore in Copenhagen, was that the country was in a feverish hurry, a giant bee-hive, judging from the seemingly infinite number of bicycles scurrying around.

On the afternoon of the day I landed as I stood on the corner of Osterbrogade and Trianglen, 126 cyclists passed me in 30 seconds. However, one rides a bicycle because it is cheaper and more convenient than walking and not to save time as at first imagined. Time is the cheapest thing on record in Denmark.

In some industries great changes in the form of improvements had taken place, in others things seemed not to have stirred at all during the past two decades. As far as the machine industry was concerned, hardly a wheel turned. Most plants had but a skeleton crew. Equipment was being overhauled, improved and rearranged in order to get greater efficiency when the better times began.

In one large plant, producing a special line of machine tools, a regrouping of equipment was then in progress. Each department was to have but one kind of machine tool. The work would come through in lots and when finished in one department would not be moved to the next unless the lot had been inspected and passed. Once the work had left his department the inspector was to be held responsible for poor work and defective material. When the machining of a lot was completed it was to be forwarded to the storeroom located at the center of the plant. The first lot sent through would be used to replace condemned parts of following lots which consequently would reach the storeroom 100 per cent complete. The assembling room was located at the border of a big machinery department comprising a number of different tools of large size. Such an arrangement reduced to a minimum hauling and handling of large machined parts which were stored on the border line of the two departments.

At this as well as at other places I visited, a large number of American-made machine tools were visible as part of the equipment. The metal industry is almost at a standstill in the city and country alike. The reasons given were:

(1) Labor was too high.

(2) Raw material and coal must be imported.

(3) Plants were too small to employ experts and specialists.

According to the latest wage scale agreed on between the employer and the labor organizations (for everyone, including the servant girls, is organized over there) a mechanic of the metal trades received for an hourly rate approximately $17 for a week of 48 hours. As everybody was employed on piecework, however, the weekly wages were considerably higher than stated and averaged approximately from $20 to $22 for a week of 48 hours.

The American mechanic is at least 50 per cent better off so far as the contents of his pay envelope go. Concerning the output or production, I have no official data to which to refer, but judging from information given and personal observation, I should say that the American mechanic produces at least 50 per cent more work than the Danish at present. The times are decidedly too slow over there and the fault is not altogether labor's.

I dropped into an office of a large concern one day and was delayed there a few minutes. There were four women and three men engaged in office-work. Five times as many empty desks signified the poor industrial conditions. One would surmise that sufficient work was on hand to keep those retained busy. They were, however, conversing with far from muffled voices. I was informed later on that one third of the population of Copenhagen is artistically inclined, another third literarily and the last third scientifically interested. This particular lot undoubtedly had artistic tendencies. The passing in and out of other officials effected only a superficial resumption of work according to the rank or position of the intruder. Such conditions prevailed everywhere. There is an old Danish proverb, "As master, so servant." Write that, "as office, so shop," and you will make no mistake in judging conditions there. Poor management resulted in no discipline and little production.

COST OF LIVING HIGHER THAN IT IS HERE

Wages were, as already stated, a good deal lower there than here. The cost of living, however, was much higher there. It is a well-known fact that Scandinavians eat much fish. Nevertheless an agitation was going on to stimulate the fish business. One of the statements used was that fish was cheap compared with other commodities. I quote some prices from the *Dansk Fiskerilidende* of August fifteenth: "Eels 30 to 35c., flounders 30c., herrings 15c.," all per lb. The paper added, "this week's low prices are due to the poor quality of the fish." These prices are 40 per cent higher than those in New York for the same period.

House rent! Well, per room the rent was about equal there and here. However, a worker had rarely more than two rooms and a kitchen and often one room and a kitchen, so that his expenses were smaller. As far as conveniences went, he had none. No wonder dissatisfaction has become a national disease.

One day a farmer called on me. "I have come," he said, "to see what an American looks like and to ask you how it is that the Americans are smarter than other nations. I am past sixty," he continued, "and I have tried British and German farm machinery. The American's beats everything. I use but American tools."

I visited different parts of the country and everywhere people took a certain pride in showing me the American-made tools they had bought in preference to the makes of other nationalities. There was a great sentiment in favor of American tools and other goods. The prices, however, were prohibitive. American-made canvas shoes with rubber soles were sold for $1.95 in Copenhagen; here for $1.19. The cheapest Ford car was advertised at 3,060 kr., equal to $680; a Ford sedan at 5,100 kr., equal to $1,130.

Terms of Payment for Exported Machinery

By W. H. Rastall
Chief Industrial Machinery Division, Bureau of Foreign and Domestic Commerce

Practically all machinery represents a capital investment, as contrasted with hardware, haberdashery and other classes of commodities that pass directly into consumption. As good banking makes it necessary for lending institutions to maintain their accounts in liquid form if possible, it is perfectly obvious that a banker is justified in restricting his loans in so far as they apply to machinery. It will also be recognized that the ordinary machinery manufacturer will not have sufficient capital invested in his business to justify him in tying the capital up for long periods. Some reports received from foreign countries in connection with export business suggest that foreign buyers should be allowed liberal terms. One might infer from those reports that a year or more should be granted to the purchaser.

There is nothing about the export business that makes it necessary to engage in unbusinesslike practices. Properly handled, export trade in machinery is one of the cleanest and most attractive kinds of business, and unless there is some particularly good reason to the contrary, the trade should be kept upon this basis. For a manufacturer to allow his customers a year, or more, or less, in which to pay for factory machinery, appears to be a most unbusinesslike procedure, because one must infer that he is encouraging his customers to build factories without first providing adequate capital. In ordinary cases it therefore appears that so far as factory and industrial machinery is concerned, the user should have funds with which to buy before being allowed to sign a contract. This fact in itself suggests that it will not ordinarily be necessary to grant unusual terms in connection with machinery sales when these transactions represent investments of fixed capital.

The Machine Dealer Abroad

For simplicity the transaction has been suggested as being executed directly between the machinery manufacturer in this country and a factory owner abroad. But such transactions are unusual. Almost invariably American industrial machinery is sold in foreign countries through machinery dealers residing in the various foreign cities.

From the very nature of his business, the foreign machinery dealer, to be successful, must keep his capital turning over very rapidly, and for the purposes of this discussion it may be desirable to assume that this dealer will turn his capital over some five or six times a year. He will therefore prefer to arrange his transactions in such a way that he is able to collect from his customers before paying his obligations to his principal. Obviously, it is to the manufacturer's interest to promote the convenience of his foreign representative, and terms should be extended that will allow the foreign dealer time to adjust his financial arrangements. This scheme complicates the discussion, because there is an endless variety of terms extended to foreign buyers by these foreign dealers.

Frequently the machinery dealer abroad will negotiate a contract arranging for payment perhaps one-third with the order, one-third on delivery, and one-third after test. If, for purposes of argument, we assume that the customs duty, delivery charges and dealers' profit at destination approximate one-third of his contract price, it becomes clear that the final payment he secures from his customer covers his expenses after the arrival of the consignment at point of destination, and the two earlier payments make it possible for him to pay the original charges shortly after arrival. This arrangement, in fact, is a very common one, and again shows the possibility of making prompt payment. There are a large number of transactions where this particular arrangement is not possible, but on the other hand in most cases it will be found that terms such as those just described are actually employed. It will therefore meet the dealer's requirements if the consignment is accompanied by a draft payable soon after the arrival of the shipment.

Selling Through Branch Offices

The situation just described again implies that the manufacturer has sold direct to a dealer in a foreign city, but in those instances where the dealer or importer has an American office which acts as exporter, the manufacturer would then be called upon to sell to this American branch. Ordinarily, the foreign exchange bank will buy the draft that accompanies the shipment, so that it is unnecessary for either the manufacturer or the exporter to tie up his capital in the transaction, and the business risk narrows to that of issuing the draft. In those cases where the transaction is handled through an exporter, the manufacturer will ordinarily receive his payment in cash against documents, that is, cash discount or net 30 days, and will be free from further financial responsibility. But in cases where the manufacturer issues a draft, he will not be able to discount it "without recourse," and therefore must carry a certain amount of responsibility until the draft is finally liquidated.

When a manufacturer agrees to sell direct to a foreign consumer or dealer, it becomes clear that he accepts very definite responsibilities, in addition to those involved when he sells to an export house, and it is suggested that care be exercised in making a decision of this character. It is clear that when the manufacturer sells to the exporter he is not called upon to give unusual terms, and will ordinarily be able to secure cash on delivery, thereby placing the business upon a very attractive basis. It is felt that most machinery business should be so handled.

It is also felt that few manufacturers will have an export business of sufficient magnitude to justify them in expanding their organization enough to handle quotations direct to buyers in foreign countries. Such an arrangement implies that they will maintain in their organization men qualified to manage the financing of the transaction while the goods are at sea, which will also usually imply that the organization must be able to arrange for ocean freight and marine insurance, consular invoices and packing lists in foreign languages, matters which seem simple at first, but run into a great many complications in the end. These are responsibilities which should not be assumed lightly.

For a manufacturer to sell machinery on deferred terms, somewhat as might be suggested by articles recently published, is most unwise, as it would be perfectly possible to tie up the entire capital of the company in an unliquid form within 60 days, and it could easily develop that these amounts might not be liqui-

dated for months, or even years. Such an arrangement is most unbusinesslike. In fact, it is hard to understand why a manufacturer should consent to send, say $10,000 worth of factory equipment, to some remote point in Asia, Africa, or Australia, unless he is absolutely sure of his payments, as the loss that would be involved in case of complications would consume the profits on many otherwise normal transactions.

There are exceptions to all rules, and a concise statement of the conditions affecting the terms of payment employed in connection with machinery transactions of great variety, involving all countries in the world, is subject to many limitations. The above paragraphs represent an effort to state the situation in its elementary form. There are circumstances when a thoroughly businesslike organization is justified in extending liberal terms to foreign buyers. One large corporation in the United States, manufacturing machinery, maintains a revolving fund of $25,000,000 which is employed in granting liberal terms to foreign buyers, and this fund has gone a long way in the development of the foreign business of that corporation. The plan it represents undoubtedly was worked out along thoroughly businesslike lines, and the business is handled with rare judgment and discretion.

But notwithstanding such exceptions, the fundamentals previously outlined will be found to apply to most of our manufacturers, who should be exceedingly careful to handle their foreign business wisely, and restrict their operations to methods that are strictly businesslike, discriminating between transactions that involve the investment of fixed capital and those applying to consumable goods.

Overstocking Leads to Demoralization

In the overstocking class will be found machinery stocks carried abroad by foreign dealers. It is undoubtedly to the interest of the manufacturer of standard lines of machinery to have his foreign representative keep on hand a reasonable stock of such equipment as is regularly in demand, in order that buyers may secure prompt delivery, may have the privilege of inspecting the goods before purchase, or may even see the equipment in operation. This method of doing business has some further advantages. Although it is ordinarily desirable that the foreign machinery dealer invest sufficient capital in his enterprise to cover the cost of these stocks, there are also circumstances where it is to the interest of all concerned to allow this dealer a reasonable amount of time before it is necessary to tie up his capital in such equipment.

Such circumstances may prove an exception to the general rule, as stated in the earlier part of this article, but even in such cases the matter should be handled with great discretion, as the dealer should not be encouraged to load up his warehouses with unsaleable material. Any stocks so placed should be turned over very rapidly; furthermore, they should be kept down to limits that will not prove embarrassing in times of depression, and it will be remembered that depressions sometimes come very suddenly. Only under rare circumstances is a manufacturer justified in overloading his market. It is far better to conduct operations on a basis that encourages constructive sales methods. Demoralization is certain to result from overstocked markets, and demoralization destroys business. The granting of unusual terms in order to encourage stock orders is consequently subject to decided limitations.

Without going into further details, it appears that so far as industrial machinery is concerned manufacturers should not take too seriously reports coming from foreign countries intimating that more liberal terms should be granted in connection with export business. Furthermore, experience indicates that European manufacturers, as well as American, do not grant exceptional terms in connection with equipment representing fixed capital investments. A great deal of confusion has been developed in connection with this subject, and possibly in some instances this confusion has been brought about deliberately. Excepting those instances where a manufacturer can arrange to have his *del crederes* discounted by a bank, and practically without recourse, deferred terms should not be extended.

What *Is* Profit?

By Harry Senior

Our old friend Entropy in his article entitled "How to Secure Co-operation," published on page 1012, Vol. 57 of *American Machinist*, tells us quite a bit about co-operation of one kind or another, and though I am obliged to confess that after reading his article I have learned more about how *not* to secure co-operation than otherwise, there is much truth in what he says.

The statement that challenges my attention is in his second paragraph where he says: "The nearest to good co-operation seems to lie in places where the plant is not too large for one man to dominate and where the one man painstakingly selects and trains his subordinates into a sort of hero-worship of himself." *But* he says further: "This kind of co-operation does not always lead to the greatest profit."

This brings me to my opening question: What *is* Profit? If Entropy means the actual amount of money that is left over after any given period to be distributed among the stockholders, profit may well depend upon many things other than co-operation in the plant. For one thing it may depend almost entirely upon the necessity for or desirability of the product—the demand. It may depend largely upon the condition of the market as affected by competition, or, in the absence of competition, and if the product is a virtual necessity, it may even depend upon the "gall" of the man who fixes the price by charging any old sum he can get!

In my opinion there are other kinds of profit than those that may be reckoned in dollars and cents. I believe that a strong, forceful man, capable of making himself feared (and hated), careless of the convenience and comfort of his employees and even indifferent to their safety—in short, a slave driver—can extract the greatest amount of monetary return for the labor of his men in a given time. But I would not reckon this as profit, for he, or someone else, will surely be called upon sometime to account for his stewardship.

Has not that man made the most profit who has "trained his subordinates into a sort of hero-worship of himself," who has looked after the comfort and well-being of his employees and their families (who are indirectly his employees), has paid them satisfactory wages and performed the numerous other duties that enable him to command their respect, affection and loyalty *because he has earned it*, and is able under these conditions to live comfortably, keep his plant operating at a reasonable degree of efficiency, pay his stockholders enough to keep them quiet?

Ideas from Practical Men

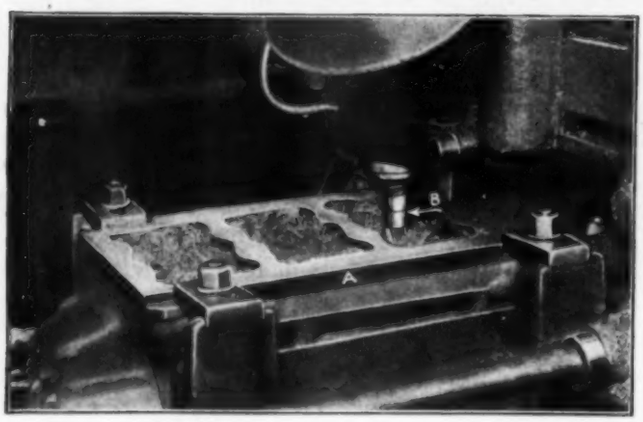
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Profiling a Cylinder Head

BY FRANK C. HUDSON

There is a growing tendency among the manufacturers of internal combustion motors to machine the inside of the cylinder head, principally to secure a uniform volume in each cylinder and in this way, maintain the same compression ratio in all cylinders. This is a profiling job and in the case of the Pierce-Arrow cylinder head the guiding is done by a plate which fits over the face of the cylinder head as shown herewith.

The guide plate is shown at *A* and when the profiling cutter *B* is down in the cut, the shank above the teeth



PROFILING COMBUSTION CHAMBERS IN CYLINDER HEADS

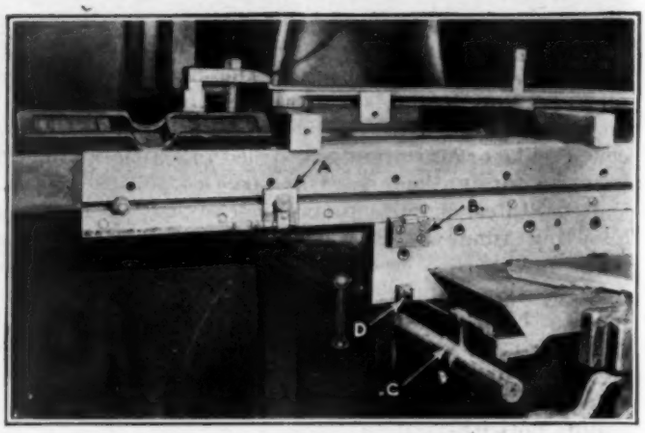
acts as the guide roller and readily follows the outline of the form. This does away with the use of a separate guiding spindle and a form at some distance from the work. The operator guides the cutter to the work by means of suitable handles which lead the drilling spindle across and the work lengthwise under control of the guiding plate.

Laying Out Work by Machine

BY ROBERT BRAINARD

Although a laying-out machine employing the principle described below has been recently placed on the market, this idea has been in use in our plant for some time.

To the front side of the table of a Becker vertical milling machine, as shown in the illustration, a micrometer head *A*, was attached by means of a knurled-head screw, so that the micrometer head could be shifted whenever desirable. An anvil *B*, was attached to the saddle of the machine, in line with the micrometer head. Another micrometer head *C*, was clamped to the shaft as shown and a corresponding anvil *D*, was attached to the front of the saddle. The use of standard length measures, together with Johansson gage blocks,



MICROMETER HEADS ON A VERTICAL MILLING MACHINE

makes it possible to space holes accurately on the machine without the use of buttons. The length measures are shown lying on the bed of the machine and the box that is used for carrying such gage blocks as are necessary for use at one time, can be seen on the left end of the table.

A Problem in Shop Trigonometry—Discussion

BY EDWARD J. RANTSCH

The criticisms of my article under the above title, which were given by M. Tolliver on page 971, Vol. 57, of *American Machinist*, show that the problem in question has not been solved by Mr. Tolliver. If he will look a little further into the problem, he will find that he failed to calculate the length of chord *E* and the lengths *B*, *C*, and *D*. As stated, this was strictly a problem in trigonometry, in which it was desired to calculate the various unknown dimensions.

Mr. Tolliver is entirely wrong when he speaks of scribing the outline of the groove, when as a matter of fact no lines are laid off at all. In the first place, the $\frac{13}{16}$-in. radius cannot be accurately laid off, as the one leg of the dividers would have to be on the circumference of the 1.875-in. diameter circle. In the second place, the manner in which the groove is actually produced consists of making all the calculations first, as shown in my article on page 733, Vol. 57, of *American Machinist*, and then applying the calculation to the set-up on the milling machine in which all the dimensions are worked by the dials on the machine with reference to the work and cutter, and measurements taken to check up the various dimensions.

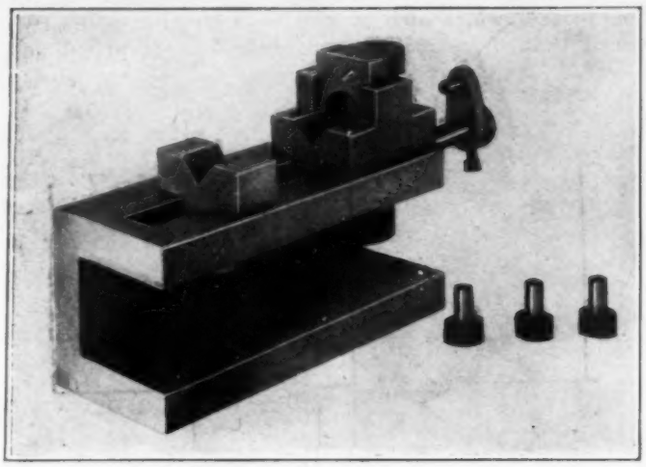
I trust Mr. Tolliver will be able to see that he was very slack in his judgment of the article and of what was actually required, not to mention a word in reference to the silly questions he asks at the opening paragraph of his criticism. These questions make him appear more ridiculous than a schoolboy.

Drilling Round Stock

By Edward Bannon

Sometime ago I saw an article in the *American Machinist* about a jig for drilling round stock, so I am sending a photograph of one that I think is better though it took quite a bit of work to make it. The work to be done had to be accurate so it paid to do good work on the jig. The V-blocks are adjustable along the slot in the base, which is made in channel section in order to let the chips drop down readily.

The drill bushing is carried in a sliding frame which is clamped down on the bar to be drilled by means of a hand nut, or rather capstan nut, underneath. If the bar cannot be locked tight enough by hand a hook spanner may be used on the nut. The end stop is easily



A JIG FOR ROUND STOCK

adjusted and various sized drill bushings can be slipped into the hardened and lapped bushing set permanently into the sliding member. The bushings are slightly taper so that they are wrung into place and hold without any other locking means. For our work we have found this kind of a jig very satisfactory.

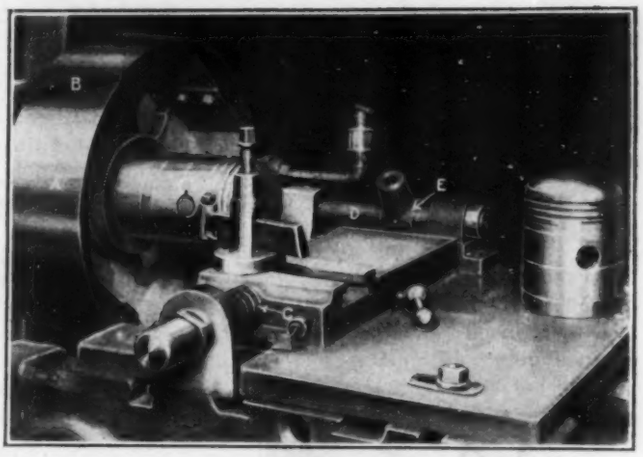
Relieving Pierce Arrow Pistons

By Frank C. Hudson

While the Pierce Arrow method of relieving pistons is not unusual, the device is enough out of the ordinary to warrant a little examination. Instead of a narrow face cam as is frequently used, the cam *A*, of both large diameter and wide face, is mounted directly on the spindle of the LeBlond lathe shown. The wearing faces of the cam are of hardened steel and inserted as shown at *B*. The piston is held by a draw-in chuck using the regular piston pin method for this purpose. The tool block and slide are made especially for this work and mounted on the lathe carriage. The controlling spring is shown at *C*.

The follower is at the back of the lathe and operates the slide through the shaft *D* by means of the lower end of the block *E*. The upper end of this block is drilled to receive a bar so that it can be operated by hand at any time.

The completed piston at the left shows what a clean cut line is produced at the edge of the relief. It can be seen that instead of having the relief of uniform width, the piston grows gradually wider at the top



RELIEVING THE SIDES OF PISTONS

where the heat from the head affects expansion most. The saw slots below the third ring groove as well as the type of piston used are also shown.

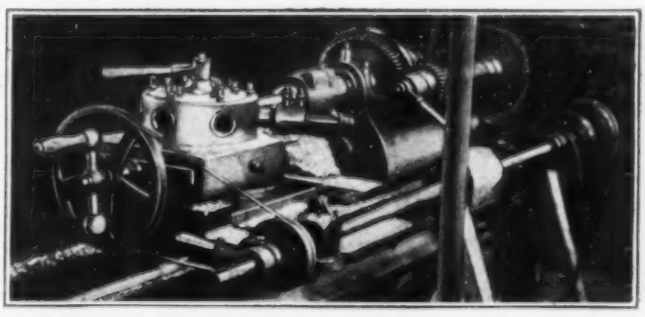
Grinding Grooves in Cork Floats

By Rogers McCullough

A unique method of machining cork was recently devised in a local machine shop. The machining of cork was not a usual thing in this particular shop and considerable experimenting was done before the job was finally a success.

The problem at hand was the machining of grooves in cylindrical cork floats having a diameter of approximately six inches. As a first attempt, cutting with special lathe tools was tried. High speeds and low speeds were used, but none of them would cut without tearing the material badly. At last grinding was suggested, and this method accomplished the job.

An angle plate was fastened to the compound rest on a small engine lathe. On one corner of the horizontal part of the angle plate was fastened a small grinding attachment, as may be seen in the accompanying illustration, and on the vertical face a ¼-hp. motor was clamped. A coarse wheel was fitted to the grinding attachment and rounded to the shape of the desired groove with a diamond tool.



SET UP FOR GRINDING GROOVES IN CORK FLOATS

The cork float was held in the three jaw chuck of the lathe. The grinding wheel was operated by the small motor and at the same time the cork was revolved in the lathe in the opposite direction. The result was nice grooves. Being fastened to the compound rest, the motor and grinding attachment could be moved both longitudinally and transversely.

Oilstone Fixture for Flat Scrapers

By Harry Moore

The fixture shown in the illustration was used successfully in connection with a surface-plate scraping job. To explain the usefulness of the device it will be necessary first to note briefly just what occurs when a job of this kind is nearing completion.

The hills, or bearing spots on a near flat surface lie close together, so, in scraping down the highest hills it is imperative to have a definite convex cutting edge on the tools used, so that isolated high spots may be scraped down without fear of touching nearby places that do not require it. On this finishing operation, the appearance of the work depends and if the scrapers are not properly sharpened there will be an abundance of hairy scratches on the surface. It is almost impossible to stone one of these scrapers free hand, as there is always a tendency for it to dwell in different places with the result that minute flats are left on the edge and these are the direct cause of scratchy work. By using a fixture as shown these flats are avoided because the scraper is rocked backward and forward while supported on a wire holder.

FIG. 1—HOW THE FIXTURE IS USED

To make the fixture, a stand *A*, is made of cast iron on which is laid the oilstone. A hole is drilled on each side clear through. Next a length of wire *B*, the same diameter as the holes is bent as shown so it will slide up and down in the holes. Each scraper has a hole in the center of the radius of the cutting edge, so that when the wire *B* is removed from *A*, the scraper can be slid on to the center and *B* replaced in *A*. The oilstone, of course, is moved slightly from time to time to avoid wearing hollows in it. After the scraper edge has been stoned, both sides are given a few light rubs to finish.

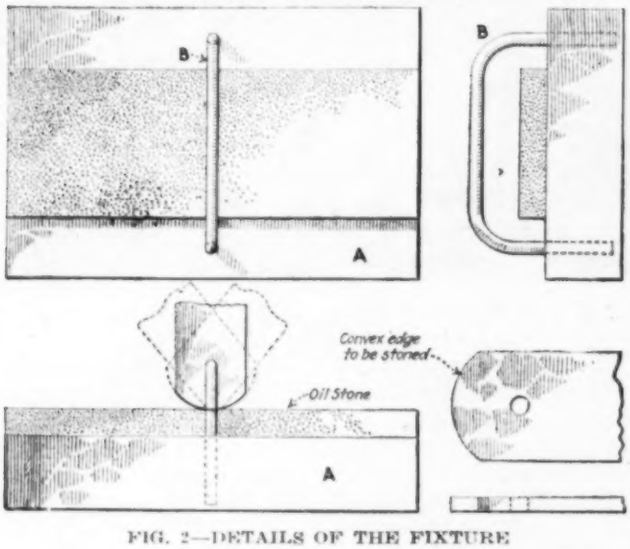


FIG. 2—DETAILS OF THE FIXTURE

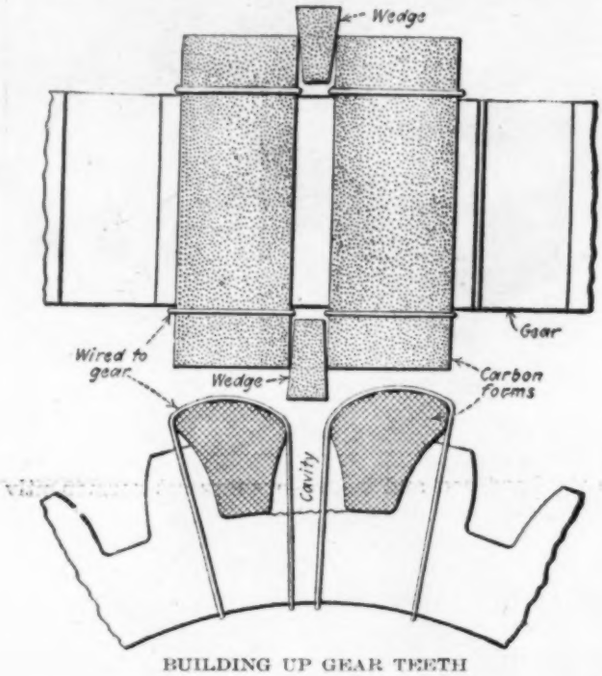
Building Up Gear Teeth with the Welding Process

By Joe V. Romig

One of the most frequent causes of trouble in and around machinery is the breaking of gear teeth, and it is up to the repair man to fix them as quickly as possible. Dovetailing in a new piece, and recutting new teeth, takes too long, while the screwed-in studs are too weak and soon wear out or cause trouble.

The only objection to welding, or the building up of new teeth by the welding process, is that considerable redressing of the new teeth is necessary before the gear can be used.

A welder, in a large machine shop, who was quite a mechanic in the machine end as well, doped out the following trick, which works to perfection. He reasoned that if he made two forms out of carbon and



BUILDING UP GEAR TEETH

inserted these forms each side of the tooth to be repaired, as shown, he could control the flow of his metal by confining it between the two pieces.

His system was to first build up a semblance of the ends on the new teeth and then place the carbon forms in place. These were wired and also were held apart and tightly against the outer two teeth with a carbon wedge.

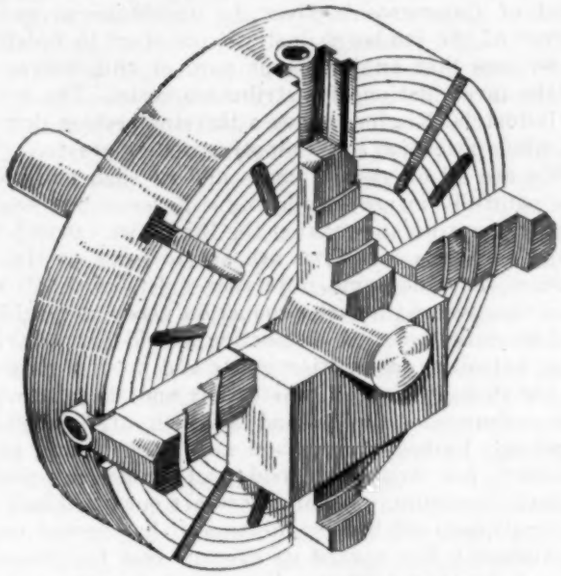
Taking his welding rod and burner, he directed the flame into the center of the cavity, pushing the rod down as fast as it fused, filling the cavity from the end with the melted metal. He was always careful to be sure that there was a perfect weld between the ends and the center metal. In this manner much hard work was saved, by eliminating most of the filing labor which was formerly necessary to bring the tooth into the correct form and shape.

The carbon forms should fit perfectly between two teeth. To assure the knitting of the tooth to the gear rim, play the torch flame into the cavity until the rim metal fuses a little, after which fill in with the rod. The space should be filled until it is high enough to leave a little metal to be dressed off the top.

To Hold Small Bars in a Chuck

By F. M. A'Hearn

Old Mac's idea, expressed on page 810, Vol. 57 of the *American Machinist*, of the way to hold small round or hexagon bars in a large four-jawed chuck by running two opposed jaws clear down to the work and using



FOUR JAWED CHUCK WITH V-BLOCK

spacers, or blocks under the two remaining jaws, serves to remind me that there is an even better way than that for accomplishing the same purpose.

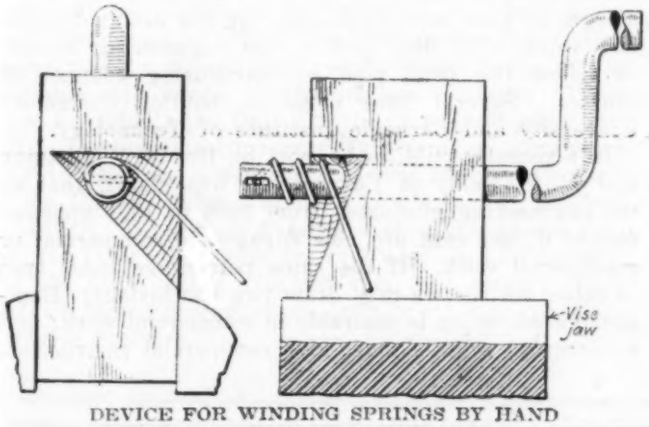
Catch a V-block in the chuck as shown in the sketch, holding it between three jaws. Now put the bar to be held in the V and bring the remaining jaw down upon it. Unless you have tried it you will be surprised to find how strongly the work will be held.

Another advantage is that when the bar is once centered it may be taken out and replaced, or others of the same size substituted for it, by backing off one jaw only. As long as the three jaws holding the V-block are not disturbed, the piece will come accurately to center every time. This kink is a time saver on repetition work.

Spring Winding by Hand—Discussion

By F. M. A'Hearn

Referring to an article by C. J. Dorer on page 810, Vol 57 of the *American Machinist*, the writer wishes to submit another method involving the use of a rod with a hole or slot through one end, which will be found convenient in winding coil springs.



DEVICE FOR WINDING SPRINGS BY HAND

The device shown in the illustration consists of a block of 4 x 4 in. hardwood, 12 in. long and a locomotive cellar bolt. A number of holes of various diameters may be bored through the block and notches as illustrated sawed into the sides of the wood to form bearings for the wire that is to be coiled. The angle of the cut forms a guide which will practically control the pitch of the coil being made.

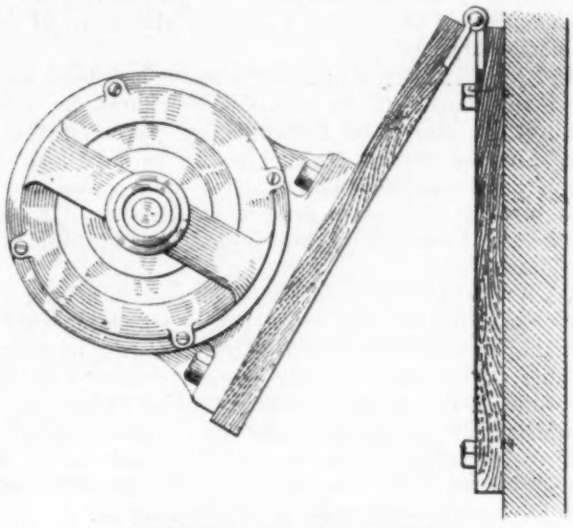
The crank end on the cellar bolt affords a convenient means for revolving the bolt when winding a coil and also overcomes the probability of the bolt straying away from the bench and being used for its original purpose. In one large railroad machine-shop all small coil springs such as those used in throttle-lever latches, reverse-lever latches and similar work are coiled in the manner described in preference to doing the work on a lathe.

Novel Method of Mounting a Motor

By A. W. Forbes

A small bench lathe was recently installed in the shops of Forbes & Myers, in which installation the driving motor is mounted in a somewhat novel manner.

Because of the high speed of the motor, the cone pulley on the rotor shaft is considerably smaller than the driving cone would be if the lathe were driven from



MOTOR MOUNTED ON A HINGE

a counter-shaft in the usual way and therefore the position of the motor changes slightly every time the belt is shifted from one step of the cone to another.

To avoid complications in the way of belt tighteners or other means of compensating for the changing center distances the motor was hung on a hinge, as shown by the sketch, so that a part of the weight is supported at all times by the belt and the tension of the latter thus remains practically constant.

The shipper rod is placed over the lathe in the usual convenient position, extending to the left where it enters a box containing a double throw reversing switch. Moving the rod to the left starts the lathe in forward motion, while moving it to the right causes it to reverse, just as the movements of a standard belt shipper would do.

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The Shop Man's Ignorance of Shop Overhead

THE ARTICLE by H. T. Lundquist, on another page, commenting on the ignorance of shop men as to the meaning of overhead expense may seem elementary to many in that it points out facts already known to the managers and executives. But it also shows very clearly how the various expenses which go to make up overhead are unknown to the shop men and how, in consequence, they get an erroneous idea of profits and exploitation.

We print this article as a suggestion that shop managers consider carefully the desirability of removing such ignorance as to profits and thereby eliminating a very potent cause of unrest. Many have already inaugurated different ways and means of instructing employees regarding the cost of doing business. Some have even gone to the point of publishing for the information of their men a detailed statement of costs in elementary language.

If "John" in Mr. Lundquist's story had been shown the many phases of the business by charts, by motion pictures, or otherwise, he would not have felt that he was being exploited. Neither would he have longed to start that little shop which in too many cases acts as a disturbing element to general business until it gives up the ghost because its proprietor knows nothing about overhead costs.

With this article as a basis, any shop manager or personnel director can work out a simple method of pointing out various overhead costs in an interesting manner. This will not only prevent exaggerated ideas of profits, but the gratification of being taken into the confidence of the management has a far-reaching appeal to any man. If we deplore ignorance as to shop economics, we must take steps to eliminate it by showing the facts as they exist in actual practice.

The Distribution Problem and Its Application to Machinery

THERE IS little doubt that the problem of distribution will hold the center of the stage during the next decade. Having discovered during the last twenty years how to eliminate at least some of the wastes of manufacture, we must now turn our attention to the matter of getting the products to the consumer. At the present time there are too many cases where the production cost is but a small fraction of the selling cost.

Evidences of the general interest in the distribution problem may be found on every side. The Anderson report, crude and incomplete though it may be, represents the first serious attempt of the government to find out why there should be such a wide spread between the price obtained by the farmer for his produce and the cost of that same produce to the ultimate consumer. We understand that the Department of Commerce is about to undertake a complete survey of the lumber industry from start to finish. It is obvious that an important part of this survey will be the investigation of distribution costs. The Society of Industrial Engineers has a thriving section devoting its whole attention to eliminating selling waste.

We are all of us consumers and as such most of us are painfully aware of the big difference between the cost of growing and making the things we eat and wear and use. As a result we are apt to jump at the conclusion that the same difference exists with all commodities, even with such production goods as machinery and machine tools. A distinction should be made, however, between consumption goods and production goods. In the shop, cutting oil, waste, files and abrasive wheels are consumption goods and as such are charged to expense. Lathes, planers and milling machines, on the contrary, are production goods and as such are charged to capital account. Machinery wears out eventually just as small tools do, but by the time it has served out its usefulness it has earned its original cost for the owner many times over. Strange to say, it is generally true that the spread between production and selling cost of production goods, such as machinery, is considerably less than that for consumption goods.

By all means let us make a determined effort to reduce selling costs and eliminate distribution waste, but before we start let's determine where the waste is greatest and go after it at that point. Saving 10 per cent of a distribution cost which is half of the selling price is a useful job, but not nearly so useful as saving an equal percentage where the distribution cost is four-fifths of the selling price.

More and More Engineers Are Choosing Commercial Occupations

ENGINEERING colleges and universities continually engage in research work intended to add to the knowledge of industries. Curiously enough they have not until recently realized an important characteristic in their own industry—the trend of the engineer toward commercial occupations.

A machine manufacturer, finding that many of his machines are being used for work not intended in the design, at once sets about adapting his design for the new work. We may look to the engineering schools to follow the same plan by introducing commercial courses. Several have done so, notably Cincinnati University and Carnegie Institute of Technology.

In a recently published report by Dr. W. F. Rittman and W. F. Reilly of Carnegie, it was shown that of the engineering graduates from 1908 to 1921 approximately 67 per cent are now engaged in commercial or managerial work. If the same percentage holds true in other schools we may draw two conclusions: Engineering education is desirable in commercial work; and engineering schools must give commercial instruction.

Effect of the Ruhr Occupation on American Exports

OPINIONS in this country are divided as to what the French occupation of the Ruhr valley portends. The more pessimistic are predicting another general conflagration in Europe. The Administration is being belabored for its do-nothing policy although the critics have been quite unable to suggest a single workable plan that might have been adopted.

Others feel that although France has had the greatest provocation and is well within her rights in occupying German territory, she has chosen a poor way to collect indemnities. Certainly the hatred that is being generated in Germany is not going to help much in bringing to Europe the spirit of peace and co-operation which must precede any real return to prosperity.

So far as world trade is concerned it seems inevitable that the reduced credit of France and Germany will mean a leaner market for the American small grain farmer. As a result his purchasing power will suffer and he will not buy as much from American manufacturers as he would otherwise have done.

On the other hand the Ruhr occupation will mean two things to German industries, particularly those in the metal-working field. In the first place lack of fuel and added difficulty in obtaining raw materials, not to speak of reduced output from nervous and unsettled workmen, will mean a big slowing down of production. In the second place the uncertainty as to what will happen in Central Europe as a result of the occupation will make the foreigner hesitate to place orders with German manufacturers. American, British and Belgian machinery builders will thus enjoy a respite from German competition that will not be unwelcome.

It would be well for American machinery men to keep this fact in mind in planning for foreign business. At the same time they should realize that barring France, Germany and Austria, the world is in a far healthier and more prosperous state than it was a year ago. Just as one sore toe drives out of one's mind any thought of the nine well ones, so is the European disturbance likely to lead us to forget that we have big markets elsewhere.

The Safety of Air Travel

WHEN THE DAILY papers announce an airplane accident we are very apt to forget that travel by air has become so common that it is no longer news, and that only the accidents find space in the daily press. As an indication of this it is only necessary to note that approximately 200 airplanes were flown to or at the National Air Races in Detroit last October. These races brought to the United States five world speed records. During this time over 292,000 miles were flown over the courses and across country from many parts of the United States without a single serious accident or injury. Three racing planes crashed during the contest but their pilots were not even scratched. Considering the high speeds attained this is a record which shows a tremendous advance, both in machine construction and personal skill.

The Army Air Service flew 121 machines, these coming from nearly every army flying field in the country. The Navy flew eleven machines to Detroit from various air stations in the East, while the Air Mail Service flew twelve machines, one from each of the principal controls on the transcontinental air mail route. Twenty-eight civilian planes visited the meet and carried seventy passengers on the round-trip flight to and from the races.

As an indication of progress in commercial aviation one needs only to note the announcements of the Aeromarine Airways, Inc., of its third season of air service between Key West and Havana and between Miami and Bimini, Nassau. The Santa Maria which has the world record for commercial flight, having had more than 40,000 miles of air travel, is now flagship of the Aeromarine fleet which until a few weeks ago, had the enviable record of never having lost a passenger. And even its first accident, while deplorable in every way, leaves its percentage of safety very high, much higher than many other modes of transportation.

With the safety of air travel increasing, as indicated by the figures given above, there can be no doubt, even in the minds of the most skeptical, as to the growing necessity for this mode of transportation. Those who work to hasten the coming of air travel by aiding in securing suitable landing fields, and in other directions, will be remembered long after those who doubt its progress have been forgotten. Every new mode of transportation enlarges the possibilities of human activities and enjoyment. It also has possibilities of doing much to knit the various peoples of the world more closely together and so promote greater harmony.

Just Suppose

JUST SUPPOSE the steering wheel of your car had too much lost motion, that there was a knock somewhere and that the paint began to be rusty, wouldn't you send the car to the garage to be fixed up and painted? Of course you would—unless you were about to buy a new one.

Now suppose the machines in your shop begin to look shabby for lack of regular cleaning and a coat of paint, that the frictions on the lathes slip, the planer foundation has settled and the milling arbors are out of true. Do you send them right away to the garage to be fixed up and painted, and do you even consider the possibility of buying new machines?

Well now, you say, one should not be too hasty spending good money on old equipment and, as to buying new stuff, that is still another story; because, you say, equipment is for business only, whereas an automobile is for pleasure. Besides, everybody can see you run around with it and it won't do to lose one's reputation on account of a wobbly machine or rusty paint.

But suppose your reputation was affected by the condition of your shop, then would you?

Oh, well, what is the use of asking fool questions?

Well, but—

Just suppose

Shop Equipment News

Reed-Prentice Planer-Type Grinding Machine

The Reed-Prentice Co., Worcester, Mass., has recently completed a planer-type machine for the purpose of grinding long pieces that have hitherto been beyond the capacity of grinding machines of this class.

In this machine, as shown in Fig. 1, the bed, housings and table driving mechanism are of the standard Whitcomb-Blaisdell planer construction, embodying the closed-top box bed, carrying off the grinding lubricant. The discharging orifice at one side of the table delivers the liquid to a long narrow trough, that is affixed to the side of the bed and so arranged as to conduct the liquid to a central discharge point, where it empties into a tank that is sunk below the floor level.

The view in Fig. 2 shows the discharge trough but does not show the dle is used, however, only in setting the machine for various sizes of work. The Blanchard head is fitted to slide vertically in the saddle through a distance of 5½ in., the movement being accomplished by means of the large handwheel upon the saddle. This latter handwheel is the means of feeding the abrasive wheel to the work after the position of the saddle has been fixed. No automatic feeds are provided, and there is no cross movement.

Six Simmons magnetic chucks, specially built for this job, are affixed

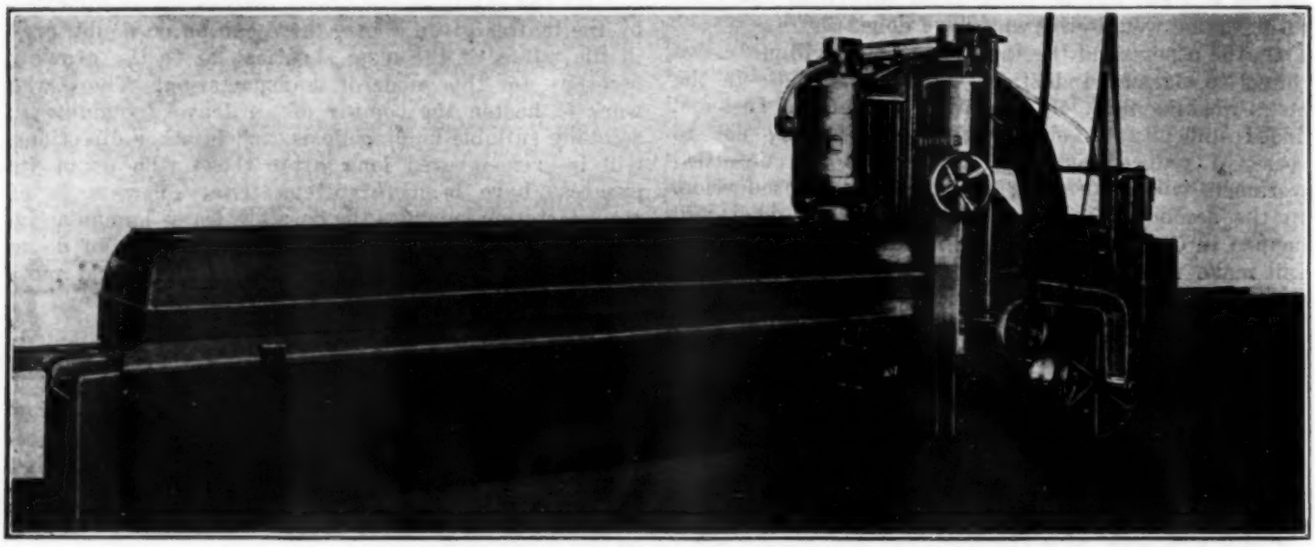


FIG. 1—REED-PRENTICE PLANER-TYPE GRINDING MACHINE

open only at the point midway of its length where the bull-gear meshes with the table rack. Detachable covers are provided for this opening, so that when the covers are in place only that section of the gear rim actually in mesh with the rack is exposed.

The ways in which the table slides are provided with the usual pockets and rotary wipers to insure constant and equal lubrication. A single-station oiling system with the tank located at the rear of the bed keeps all pockets filled with oil at a constant level, so that no part of the sliding surfaces becomes dry.

Changes have been made in the table so that the finished upper surface is entirely surrounded by a wide and deep channel for collecting and tanks, as they are to be of cement and incorporated in the foundation of the machine when the latter is installed. The foundation plans include a double compartment tank, fitted with baffle plates, screens and settling basins to remove sediment from the solution before it is again delivered to the wheel.

Instead of the usual cross-rail, the machine carries upon the housings a special saddle to which is fitted a standard Blanchard motor-driven grinding head with a 20-in. wheel. The saddle has a vertical movement upon the housings as would a regular cross-rail, operated through the usual bevel gears and elevating screws by means of the lower handwheel to be seen in Fig. 1.

The elevating movement of the sad-

to the surface of the table. The magnetic surface of each chuck is 14½ x 19¾ in. and the chucks are equidistantly spaced along the table, the intervening spaces being filled with interlocking spacers so constructed as to furnish a means of clamping the chucks firmly in place and at the same time to provide a smooth upper surface, flush with the chucks. By this means a continuous flat table surface 15 ft. long by 19 in. wide is available for holding the work, nearly half of which surface is magnetic. Electric current is conveyed to the magnetic chucks through an armored cable entering at the rear end of the table. This connection may be seen in Fig. 2 at the left.

Sheet-metal water-guards are provided to enclose the work while it is

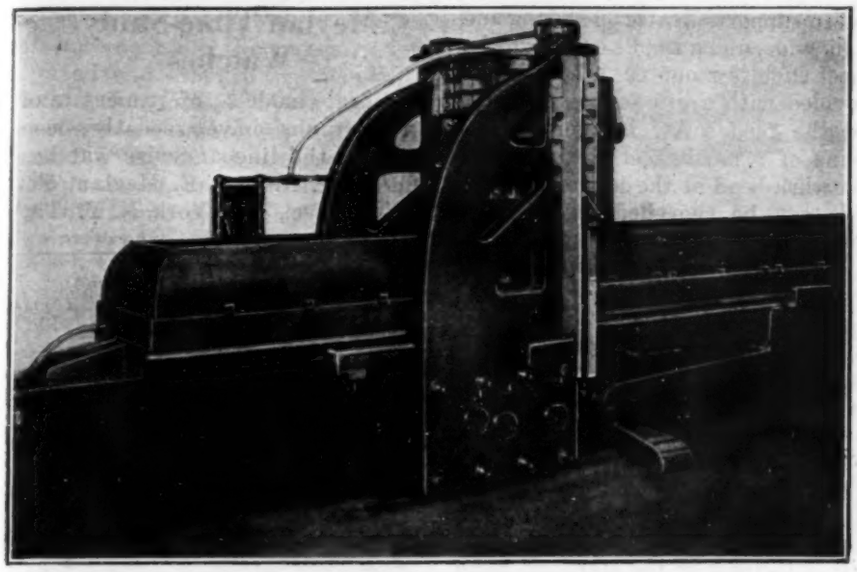


FIG. 2—PARTIAL REAR VIEW OF REED-PRENTICE MACHINE

undergoing the operation of grinding. The guards are so made as to fit over the edge of the raised flange that is permanently a part of the table, and any one or all of them may be removed at any time by merely lifting them from position. The illustrations show the machine with all guards in place.

There is a reason for making the width of the table surface 19¾ in.—equal to the length of the magnetic chucks—and it is so that the 20-in. grinding wheel will entirely cover this width and thus permit the entire area, which consists of the tops of the chucks and the spacers, to be ground to a smooth, continuous working surface, exactly parallel with the movement of the table. This operation is done after the machine is set up in the place where it is to run, and it may be applied at any time as a redressing operation.

There is no departure from the standard Whitcomb-Blaisdell planer construction in the table traversing mechanism. The regular patent by-pass reversing dogs are used upon the operating side of the table and may be instantly set to any required length of stroke. There is a reversing lever upon the opposite side for convenience in operating. The drive is by the usual open and crossed belts from an overhead countershaft, and the table may be stopped, started or reversed at any time from either side of the machine.

There is no difference, however, in the diameters of the driving pulleys upon the countershaft, and the table is thus driven at a uniform speed of 28 ft. per min. in either direction. There are, therefore, no "cutting" and "return" strokes as with a planer; the wheel is allowed to grind throughout the length of stroke in either direction.

An independently connected pump supplies lubricant to the wheel in two places, outside the wheel (but inside the wheel guard) and through the hollow rotor of the head. This feature is standard practice with the Blanchard grinding machine. The control box for the motor in the grinding head is located behind the table driving belts.

The grain and grade of wheel used should, of course, be adapted to the nature of the work to be done. This first machine was designed to grind long, hollow cast-iron bars of box section, up to 10 in. square, and the wheel used is grain 14, grade H+, American Emery Wheel grade list.

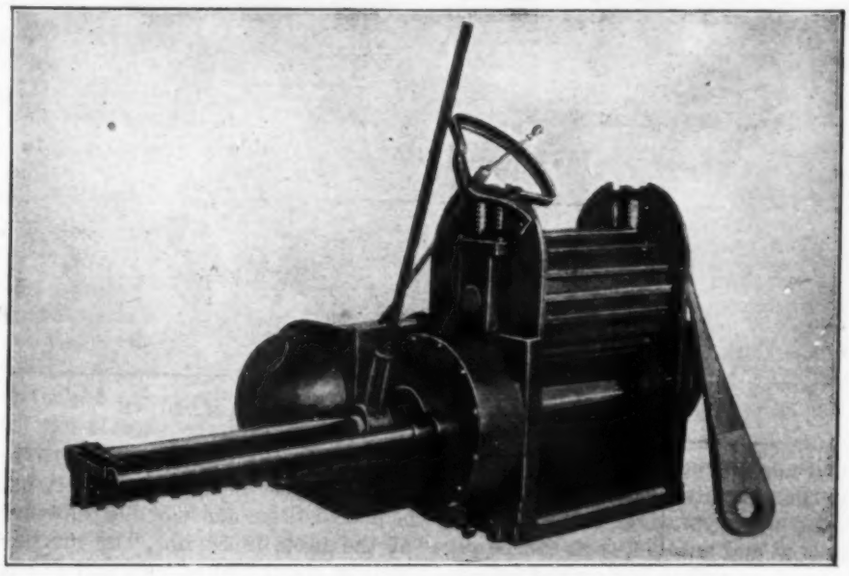
The machine will grind pieces up to 15 ft. long, 19¾ in. wide and 10 in. high. The floor dimensions are 38 ft. 8½ in. by 7 ft., and the height is 7 ft. 4½ in. The weight is approximately 15 tons.

Tempus Rotary Scrap-Metal Bundling Machine No. 3

The machine shown in the accompanying illustration is intended for tightly compressing into bundles, without shearing, miscellaneous metal scrap, such as tangled wire, cotton ties, bushy turnings, bicycle frames, upholstery springs, and sheet metal parts such as obtained from automobile bodies. By the use of the machine low-grade scrap may be reclaimed and put in the bundle form, so that it can be shipped with high grades of heavy melting stock. The machine has recently been placed on the market by Samuel H. Garrett, 234 No. 13th St., Philadelphia, Pa., and is designated as the No. 3 bundling machine.

In design, the machine is rather simple and rugged, although it is stated to be accurately made and easy of operation. The main frame is cast iron, the rods and shafts are steel, and ball or anti-friction metal bearings are employed for revolving parts. The curved surface on which the bundle is formed is chilled. The housings at the sides are securely fastened to the base, on which is mounted also a 5-hp. motor when individual drive is required.

All the moving parts are inclosed, so as to make them dust-proof and to provide for the safety of the op-



TEMPUS ROTARY SCRAP-METAL BUNDLING MACHINE NO. 3

erator. The winding mandrel is driven through a reversing friction movement and worm gearing. The worm wheel is manganese bronze; the worm is hardened steel, runs in oil and has a ball thrust bearing. There are rotating disks at each side of the machine, against which the ends of the bundles are formed.

The winch head is provided for drawing the material to the front of the machine, and also for unloading it from trucks. This last feature is important, as the material usually arrives at the machine in a tangled mass, and is difficult to unload. But little power is needed to finish the bundle up to within 1 in. of its full size. While the bundle is being finished, and for a short time only, the full power is required.

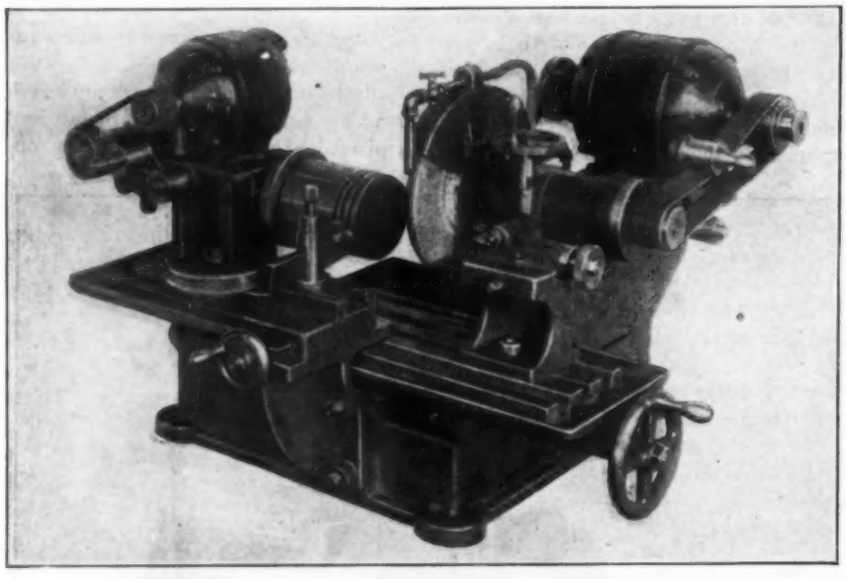
Franklin Piston Turning and Grinding Machine

A bench machine, designated as the Model T-G, because it is adapted to both turning and grinding, has recently been placed on the market by the Franklin Machine & Tool Co., Springfield, Mass. The machine is intended especially for turning and grinding automotive pistons, for which work it is shown set up in the accompanying illustration. It has numerous other uses, however, particularly in an automotive repair shop, such as turning and grinding operations on armatures, wrist pins, valves and valve reseating cutters. Both tapered and parallel work can be performed, as well as boring and internal grinding. A low heavy base 20½ in. square supports a table 32 in. long and 8¾ in. wide, and a saddle on which the wheel slide is mounted. The table is provided with a gib for adjustment, and the feed screw is operated by means of a handwheel at the right. The work head at the left end of the table can be swivelled on its base when it is desired to do taper work. It carries a ¼-hp. motor, and drives by means of a belt and worm gearing the spindle of the machine. The spindle can be arranged to hold faceplates, draw-in collets, piston adapters and lathe chucks. A tailstock that has a set-over for doing taper work can also be mounted on the bed.

An arm or bracket on the front of the base carries a cross slide that is operated by a feed screw and fitted with a toolpost of the standard lathe pattern. The tool is thus in front of the work, and in plain view when a turning cut is to be taken.

The wheel head consists of a ½-hp. motor driving a 10-in. wheel by means of a belt. An idler arm and pulley are provided for keeping sufficient tension on the belt. The handwheel mounted on a vertical shaft at the right of the wheel guard is provided for feeding the wheed toward the work, and it has micrometer graduation to increase the accuracy.

A pump is provided by means of which a continuous stream of water can be flooded over the work and the wheel. The centers are 5½ in. above the top of the table, so that 10 in. swing is provided. The centers can be placed 12 in. apart, while the travel of the table is 14 in. The machine weighs about 500 lb. net, and 625 lb. when crated for shipment.



FRANKLIN PISTON TURNING AND GRINDING MACHINE

Meylan Time-Study Watches

Several models of timers and chronographs have recently been added to the line of Swiss watches sold by A. R. & J. E. Meylan, 552 Seventh Ave., New York, N. Y. The watches are made in a number of styles and have highly finished jeweled movements. Timers of the style ordinarily employed, in which readings to ⅕ sec. are given, can be furnished with either 11, 15 or 18 jewel movements, and in either nickel, silver or gold cases. The movement is adjusted for two positions. A fly-back is provided for the hand by pressure on the stem.

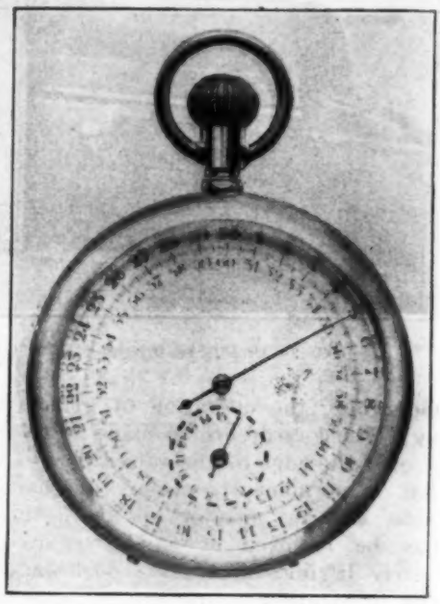


FIG. 1—MEYLAN TENTH-SECOND TIMER

The chief innovation in the line is the timer shown in Fig. 1, in which divisions of 1/10 sec. are indicated. The movement makes 36,000 vibrations per hour, instead of 18,000 as in the ordinary watch or timer that indicates to ⅕ sec. As indicated by the outer dial, the hand makes one complete revolution every 30 sec. A hand is provided on a small dial for indicating the number of minutes up to 15 that have elapsed. Movements having 11, 15, 17 or 18 jewels can be supplied.

The tenth-second timer can also be furnished as a chronograph for indicating the time as on an ordinary pocket watch, for this purpose being fitted with hour, minute and second hands in addition to the fly-back hand. The tenth-second timer can be furnished with two hands, to make a double-acting instrument.

In this style, one hand is controlled by the small push-piece on the side of the case, and the hands can be started and stopped independently or simultaneously. A device such as this is suitable for two movements going on simultaneously.

A timer of the fifth-second type for service in research work when timing operations that are intermittent, is shown in Fig. 2. This cumulative timer, as it is called, registers in seconds, minutes and hours. The fly-back hand can be stopped and restarted by means of the crown without altering the positions of the minute and the hour hands. To bring all the hands back to zero, a small push-piece located on the side of the case is brought into play.

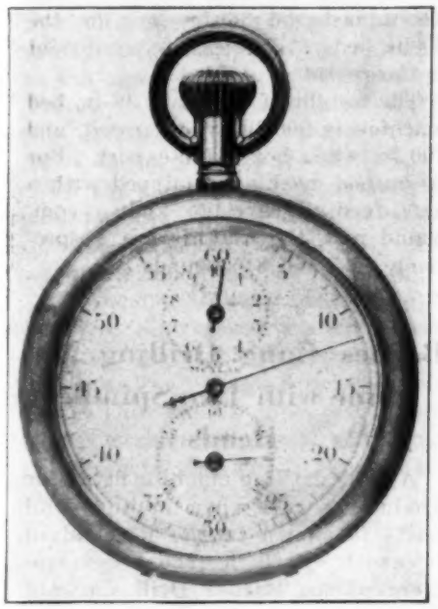
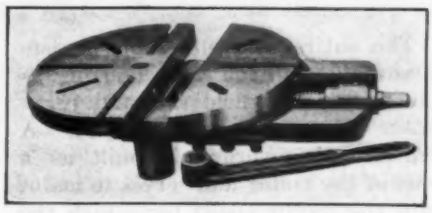


FIG. 2—MEYLAN CUMULATIVE TIMER

"Modern" Combination Table and Vise for Drilling Machine

An attachment for a drilling machine to serve both as a table and as a vise is illustrated herewith. The product has recently been brought out by the Modern Machine Tool Co., 601 Water St., Jackson, Mich., with a table 19 in. in diameter. It is similar in general characteristics to the 16-in. table announced for the same concern on page 830, Vol. 56 of *American Machinist*. The vise can be opened 10 in., so that the table then has a size of 19 x 29 in. The device weighs about 200 pounds.

Upon the removal of the standard table of an upright drilling machine, the combination device can be fitted in its place. A shank fits in the table socket in such a way that the attachment can be swiveled in the same manner as the regular table of the machine. One of the principal features of the device is that time is saved in securing a vise to the table of the machine, as work can be clamped directly in the table.



"MODERN" COMBINATION TABLE AND VISE FOR DRILLING MACHINE

When the vise is opened only a small distance, shafts can be laid in the groove in the same manner as though V-blocks were employed. Work having projections can often be so placed that it lies flat on the table and in the vise, without the use of parallel strips. The table is provided with four T-slots and with hardened jaws that may be easily replaced.

Brown & Sharpe Attachment No. 729 for Dial Test Indicator

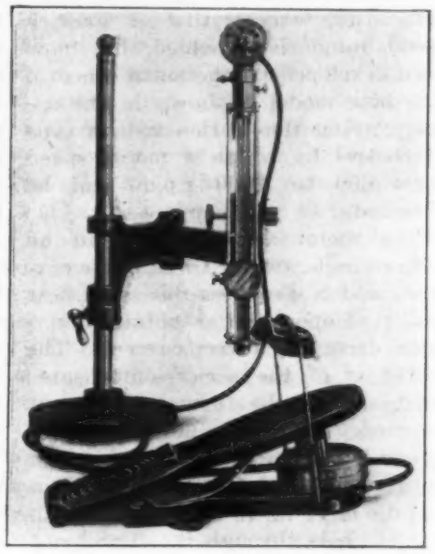
The accompanying illustration shows attachment No. 729 for a dial test indicator, that has recently been added by the Brown & Sharpe Manufacturing Co., Providence, R. I. to its line of precision tools. By the use of the attachment, the dial indicator can be employed for testing internal surfaces and those not easily reached with the regular straight spindle of the indicator.

BROWN & SHARPE ATTACHMENT FOR DIAL INDICATOR

The attachment can easily be secured to the indicator. The arm itself is a bronze casting, and is both rigid and light. The testing bar, which makes contact directly with the plunger of the indicator, is made of steel and ground. It is accurately balanced and held firmly in place by a pin through the arm. No adjustments are required, which reduces the possibility of inaccuracy.

"Sico" Pneumatic Pedal for Shore Scleroscope

The Shore Instrument and Manufacturing Co., Van Wyck Ave. and Carll St., Jamaica, N. Y., has just placed on the market the "Sico" pneumatic pedal by means of which the Model-C scleroscope such as described on page 742, Vol. 56 of *American Machinist*, can be operated. As can be seen by the illustration, the pedal takes the place of the bulb that is normally operated by hand.



"SICO" PNEUMATIC PEDAL ON SHORE SCLEROSCOPE

The pedal mechanism is secured to the floor in a convenient position for the operator. The chief feature of the pedal is the fact that it leaves both hands of the operator free to handle the work, thus giving greater speed of operation and being less fatiguing. It provides the sensitiveness and responsiveness that can be obtained by means of the hand bulb regularly employed.

The foot of the operator rests on the large plate of the device, and presses downward in order to release the hammer of the scleroscope. The pad which goes over the top of the operator's foot is adjustable in position. It enables the operator to quickly lift the foot plate, although a spring serves to retain the plate in the upward position.

The required suction and compression is obtained by the use of a para rubber diaphragm. This diaphragm is so mounted that practically all wear due to chafing is eliminated. It consists of a plain disk and can easily be replaced when it has become worn out.

Oliver No. 51 A.C. Motor-Head Speed Lathe

A speed lathe for woodworking, having a 3-phase alternating-current motor mounted directly in the head and provided with four speeds, was announced for the Oliver Machinery Co., Grand Rapids, Mich., on page 175, Vol. 49 of *American Machinist*. A lathe similar in general characteristics, except that a greater speed range is provided, has now been developed by the same concern. The new model is shown in the accompanying illustration with a type of control by which a motor speed from 600 to 3,600 r.p.m. can be obtained.

The motor can be operated on either single, two or three phase current, and it provides the same flexibility of operation as obtained in a lathe driven by direct current. The motor is of the series-compensated type, and can be furnished for any frequency from 25 to 60 cycles. The motor is fitted with ball bearings for both radial and thrust loads. The spindle is 1¼ in. in diameter and has a ½ in. hole through it. The handwheel on the left end of the headstock is used to turn the work to the desired position, or to assist in stopping the motor more quickly. For outside turning, the wheel may be used as a faceplate to hold work.

The entire controlling mechanism is contained in the same housing as the motor. No field rheostat, regulators nor relays are employed. A centrifugal governor is built as a part of the motor and serves to maintain the motor speed for which the control is set. A pushbutton switch and a handwheel control are provided as a convenient means of control. The speed of the motor can be varied simply by turning the control wheel, even while the motor is running.

The speed control operates by increasing or decreasing the intervals during which the motor receives energy from the line. The tension of the spring in the governor is adjusted by means of the handwheel on the front of the headstock, so that the current delivered to the motor can be set for the desired value of the speed. Aside from the advantages offered by the easy control of the speed, the machine is similar to all direct-driven machines in the facts that it requires no overhead belts, can be easily moved to the desired position in the shop, has a high efficiency and provides for the safety of the operator.

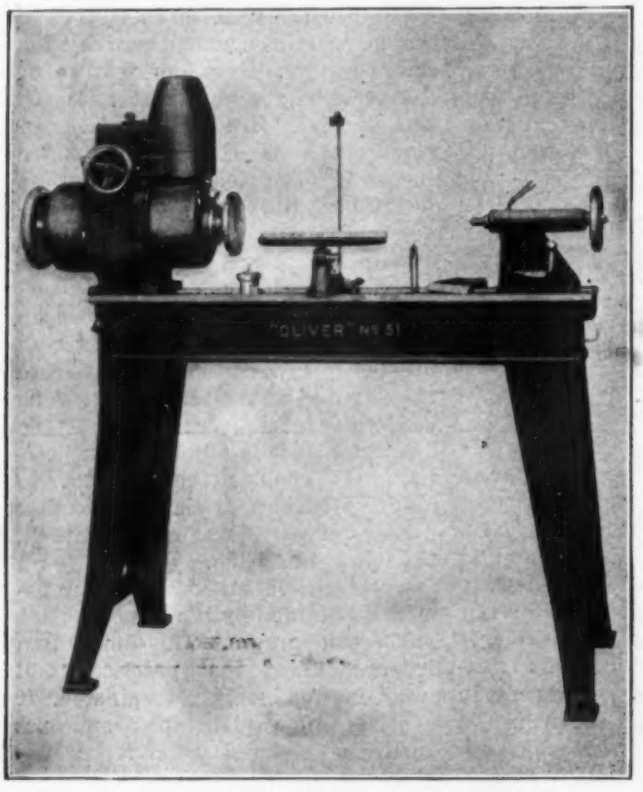
The bed is regularly furnished in lengths of 48 or 60 in. It may be arranged to carry a tool carriage having a cross feed and a compound swivel rest. Both the longitudinal and the cross movement are operated by hand. If desired, the compound rest can be removed and a socket substituted to receive a hand tool rest, so that hand turning may be done without the necessity of removing the carriage.

The machine will swing work 12 in. in diameter over the bed, and 9½ in. over the carriage. It will turn work 24 in. long between centers on the 48 in. bed and 36 in. long on the 60 in. bed. All necessary equipment is incorporated.

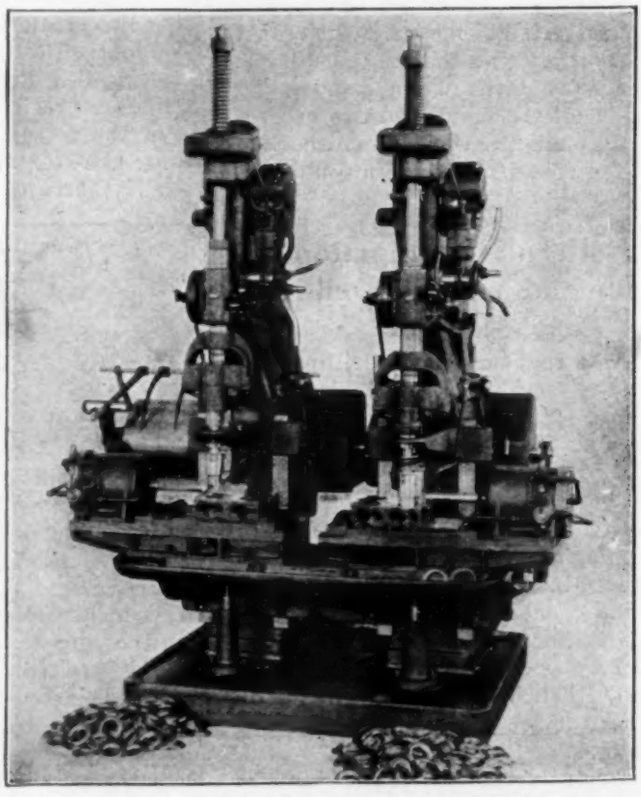
The weight of the plain 48-in. bed machine is 600 lb. when crated, and 700 lb. when boxed for export. For 60-in. bed machines equipped with a hand-feeding carriage and a compound rest, the weights are, respectively, 715 and 815 pounds.

Barnes Gang Drilling Machine with Two-Spindle Heads

A gang drilling machine fitted for production work when tapping small parts is shown in the illustration herewith. It is a recent development of the Barnes Drill Co., 814 Chestnut St., Rockford, Ill., and incorporates a number of features not ordinarily employed on the standard gang drilling machine of the concern.



OLIVER NO. 51 ALTERNATING-CURRENT MOTOR-HEAD SPEED LATHE



BARNES GANG DRILLING MACHINE WITH TWO-SPINDLE HEADS

Each spindle of the machine is provided with a two-spindle auxiliary drilling head that carries two Rickert-Shafer collapsing taps of 2-in. pipe size. The machine is fitted with a special geared thread leading feed that corresponds to the pitch of the taps used. Coil springs on the spindles automatically return them instantly upon the tripping of the collapsing taps. Brackets are provided for resetting the chasers on the upward thrust of the spindle. The small coil springs just under the collapsing taps remove the shock at the moment of resetting.

On the table of the machine are mounted two air-operated two-position jigs. Thus, while two pieces of work are being tapped simultaneously, the operator reloads the spare position. The machine is shown as set up for tapping pressed-steel spuds, or the fittings for steel barrels. The duplex pneumatic air chuck enables speed in removing and replacing the work. It is stated that the unit when attended by one operator can produce 700 pieces per hour.

The drilling machine itself, so far as each separate unit of the gang is concerned, is similar to the 22-in. machine described for the same concern on page 347, Vol. 47, of *American Machinist*. It is provided with all-geared driving and feeding mechanisms, and has the self-oiling features of the Barnes machine. The machine can be furnished with different numbers of units mounted on the same base, and equipped with either belt or motor drive. One long table or individual tables can be furnished for each spindle.

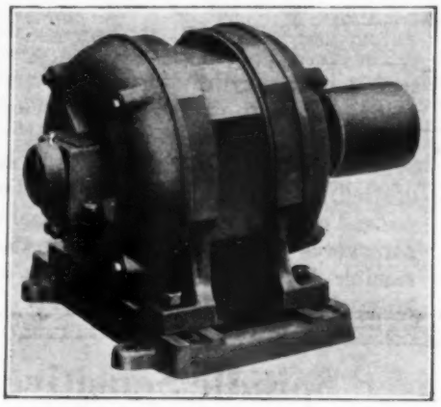
Each unit of the machine is independent and is equipped with eight changes of speed and ten changes of feed. It will handle twist drills from ½ to 2 in. in diameter at suitable speeds and feeds. An automatically operating reversing mechanism for tapping can be placed on each unit.

Louis Allis Heavy-Duty A.C. Motor

The electric motor illustrated herewith is of the squirrel-cage type for operation on polyphase alternating current. It differs from the standard design principally in the construction of the rotor. The motor is designated as the Type H.D., since it is adapted to heavy-duty work, and it has recently been brought out by the Louis Allis Co., Milwaukee, Wis.

The windings of the rotor consist of a single sheet of copper that has been punched and formed by a special process. This one-piece winding is wrapped about the core by means of a special machine and the copper bars are then expanded into the core slots by swaging. The single joint in the winding on the two end rings is silver-welded, and the end rings are then contracted by a special operation which serves to reharden the copper at the points where the heat from the welding softens it.

The shaft of the rotor is of large size and mounted in large bronze bearings equipped with ring oilers.



LOUIS ALLIS HEAVY-DUTY MOTOR

If desired, ball bearings can be supplied. Open slots are employed in the core laminations; the laminations are so placed that the slots are skewed slightly in relation to the core, and they are then riveted in position. A straight keyway is cut in the bore after the laminations have been locked together.

The windings of the stator conform to standard practice in arrangement and formation, although the method of assembly is somewhat different. The coils are very completely insulated, and they are impregnated with two coats of baking varnish to give a surface that is proof against oil and moisture. An air-drying varnish is lastly applied. The machine may be readily connected for either 220 or 440 volts. The core of the stator is made up of approximately rectangular laminated iron sheets, which are riveted between the end frames. The construction is such that liberal openings are provided around the windings and over the back of the core for circulation of air.

The system of ventilation is one of the features of the machine. The motor is guaranteed to carry its full rated load continuously with a temperature rise not exceeding 40 deg. C. above the surrounding air. After the ultimate temperature has been reached, it can carry 25 per cent overload for two hours with a temperature rise not exceeding 55 deg. The inherent ruggedness of the motor, due to the design and construction, is stated to give very high starting and pull-out torques, as well as an overload capacity.

The motor is ordinarily mounted on a base by which it can be moved backward and forward as in adjusting the tension of a belt. Only one screw is employed for this movement, and the construction is such as to prevent binding. The motor may be furnished for vertical work if desired. Back-gears that can be fitted to either the top or the sides of the motor can be furnished to suit the speed reduction necessary. A standard idler pulley can also be supplied.

The motors can be furnished in the slip-ring or multi-speed type, the characteristics being similar to those of the Watson motors. The motors are made in sizes from 1 to 10 hp. and in the standard speeds.

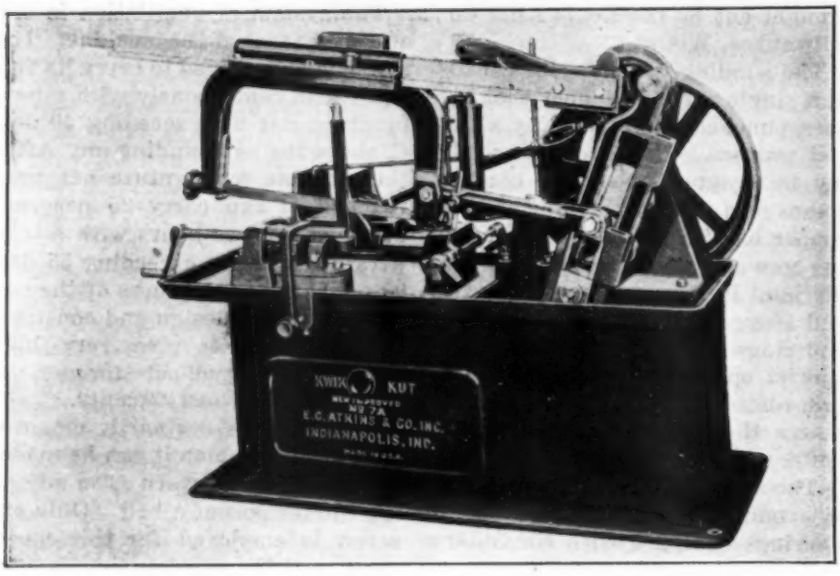
Atkins Kwik-Kut Power Hack Saw No. 7A

The Kwik-Kut power hack saw in the model No. 7A is shown in the accompanying illustration. The machine is a product of E. C. Atkins & Co., Indianapolis, Ind., and is intended for precision work when sawing materials. The machine is heavily made and carefully balanced to minimize vibration and wear.

One of the chief features of the machine is the solid cabinet base, which contains the settling tank and reservoir for the cutting compound. A plunger pump is provided in the base to circulate the coolant.

The length of the stroke can be adjusted according to the size of the material in the vise. In this way, a speed up to the maximum allowable for cutting can be obtained and practically the whole of the blade can be employed in cutting. The link blocks are made of bronze, as they must withstand severe service. Oil cups are placed where considerable oil is needed, and oil holes are provided to lubricate other moving parts.

The saw frame travels on a T-bar



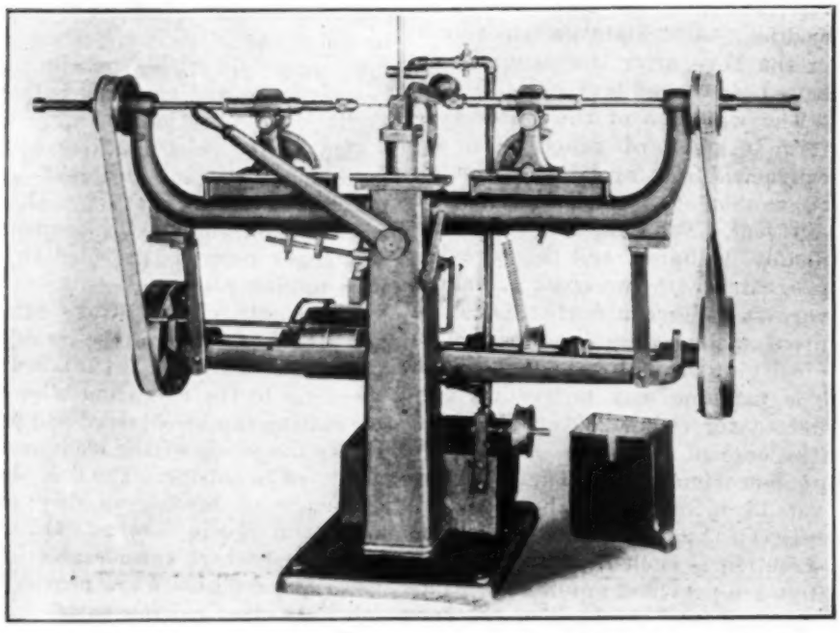
ATKINS KWIK-KUT POWER HACK SAW NO. 7A

and can be kept in adjustment for position by means of screws, so that it will always be traveling in a straight line. The blade holder is equipped with a gage to indicate whether the blade is adjusted perpendicularly to the bottom of the vise. In addition, the blade guide rests on top of the blade and prevents it from running to one side.

The feed of the machine is controlled by an hydraulic dash-pot, so that the amount of feed can be varied by simply turning a cock in the bypass. Where constant feed is desired, the cock can be set at the desired opening. The hydraulic dash-pot serves also as a cushion to the raising device, so that the blade is lowered into the cut without a jar.

Reed Horizontal Opposed-Spindle Sensitive Drilling Machine

On certain classes of work, two holes to be placed close together can sometimes be drilled to advantage from opposite sides, rather than both from the same side. The accompanying illustration shows a horizontal opposed-spindle type of machine recently placed on the market by the Francis Reed Co., 41 Hammond St., Worcester, Mass., for performing such work. The speed and the ease of operation are the principal features of the machine. All the movements can be performed by the operator from one position without the necessity of walking around the machine.



REED HORIZONTAL OPPOSED-SPINDLE SENSITIVE DRILLING MACHINE

The spindles are fed toward the center simultaneously by means of the large lever on the front of the machine. In the linkage mechanism there are adjustable compression springs, one of which can be seen just below the arm carrying the spindle on the left side of the column, by which springs the pressure on the drills can be prevented from becoming excessive. The feed motion is transmitted from the links to the spindles through gearing. Just before the drills break through the work, the hand-feeding lever reaches a positive stop, and the compression springs then provide the feed pressure to finish the drilling gradually. Gripping of the drills in breaking through the work, with consequent drill breakage, is thus prevented.

The positions of the heads are adjustable horizontally to provide for different lengths of drills. One head has a vertical adjustment for varying the distance between the centers. It is keyed to the column and can be moved by means of a screw that provides accurate adjustment.

The work-holding device illustrated is intended for cold-rolled steel rods from $\frac{1}{2}$ to $\frac{5}{8}$ in. in diameter, although special work holders can be devised to suit the work to be drilled. The work holder is cam operated, and is arranged to function in conjunction with the hand lever. On completion of the drilling operation, the operating lever is raised, thus raising the clamping lever that can be seen underneath the weighted arm on the rear of the fixture. The jig is thus opened, so that the operator can remove the work and insert a new piece. The operator feeds the work to the fixture with one hand, and feeds the drills forward with the other.

The machine as shown is arranged for belt drive, one countershaft serving to drive both spindles. The oil pump for circulating the coolant is driven from the countershaft, and a tank is provided on the floor for holding the lubricant. The tank shown on the right can be fitted around the work holder to catch the lubricant and aid in returning it to the floor tank that serves as a reservoir.

News Section

Less Machinery Made in 1921 Than in 1919

The Department of Commerce announces that reports made to the Bureau of the Census show a considerable decrease in the activities of establishments engaged principally in the manufacture of machine tools during 1921, as compared with the returns of 1919. The total value of product reported amounted to $67,769,000—a decrease of 68.1 per cent since 1919, when the total value of products was $212,400,000. The figures for 1921 do not include establishments reporting products valued at less than $5,000 each. The difference in the number of establishments at the two censuses is further explained by the fact that a number of those reporting for 1919 were out of business in 1921 and others had so changed the character of their operations as to require classification in some other industry—that is, machine tools were no longer the product of chief value.

Of the 349 establishments reporting products valued at $5,000 and more in 1921, 98 were located in Ohio; 37 in Massachusetts; 29 in Connecticut; 25 in New York; 25 in Michigan; 24 in Pennsylvania; 23 in Illinois; 17 in Wisconsin; 15 in Indiana; 12 each in New Jersey and Rhode Island; 7 each in Missouri and Vermont; 6 in Kentucky; 3 in New Hampshire; 2 in Minnesota; and 1 each in California, Delaware, Iowa and Maryland.

The decrease in production has been accompanied by decreases in the number of persons employed, in the total amount paid during the year in salaries and wages and in the amount expended for materials.

Considerable fluctuation is noted in the number of wage earners employed each month during the year. In January, the month of maximum employment, 14,773—the minimum representing 40.4 per cent of the maximum. The average number employed during 1921 was 21,321, as compared with 53,111 in 1919, a decrease of 59.9 per cent.

Conditions Improved in Massachusetts

Improved business conditions are reflected in the report just issued by the Massachusetts Department of Labor and Industries. Since September of last year the Division of Statistics has collected at regular intervals data bearing on employment and wages in manufacturing establishments of Massachusetts. Data based on reports from 202 factories show that both employment and wages had risen between October 15 and November 15 of this year, and that practically all are now working on a full time basis.

The aggregate number of employees on the pay-rolls of these 202 identical establishments for the pay-roll week in November was 123,361, an increase of 2,730 persons or 2.3 per cent, when compared with the October aggregate (120,631). Increases in the number of employees were noted in 16 of the 18 industries named. A decrease occurred in the manufacture of automobiles, incuding bodies and parts, and in the men's clothing industry.

Lamme Honored by Ohio University

Benjamin G. Lamme, chief engineer of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., was awarded the Joseph Sullivant medal by Ohio State University on January 13. The Sullivant medal is to be presented every five years to a graduate of the university who has achieved some notable success through engineering. Mr. Lamme is the first aluminus to receive the award. He has long been identified with electrical engineering in this country and has invented many important devices now in common use. He has been connected with the Westinghouse Co. since 1889.

Brown Portable Conveyor Company Sold

The Standard Conveyor Co., North Chicago, Ill., has purchased the rights, titles and patents pertaining to the Brown Portable line of portable and sectional piling, elevating, conveying, loading and unloading materials. This line of machinery has been made by the Brown Portable Conveying Machinery Co., North Chicago, Ill., for the past ten years. No major changes in the personnel will be made.

Canadian Distributors for Webster Company

According to reports, plans are being formulated by the Webster Manufacturing Co., Chicago, and Tiffin, Ohio, to market its elevating, conveying and coal rehandling machinery in Canada through a new Toronto company which will be headed by William Inglis, president of the John Inglis Co., of that city.

The Inglis Co. at the present time is making certain of the Webster lines and these together with its own products will be marketed in Canada by the proposed company.

Alfred T. Sturt is Dead

Alfred T. Sturt, chief engineer of Durant Motors, died recently in New York City following a short illness. Mr. Sturt was forty-five years of age and had been identified with the automotive trade for the past eighteen years. He was associated with the General Motors for several years and later was chief engineer of the Chevrolet Motors Co.

American Engineers Get Brazilian Army Contract

We are informed by the Tropenas Co. Engineers, Brooklyn, that its Rio de Janeiro offices have been appointed consulting engineers for the Brazilian War Department and will be engaged at the Rio de Janeiro War Arsenal. E. M. Roubieu of the company will be in charge of the work. The work which will be done by the Tropenas Co., for the Brazilian Army closely resembles the work that will be done by the United States Naval Mission for the Brazilian Navy.

Much American machinery is required for the work and it has been announced by the Tropenas Co. that the following items have been called for already: Die casting machines to produce threaded zinc bushings for shrapnel fuses, centering machines for 75 m/m shrapnels, shell banding machines, machinery to weld copper bands or producing them from tubing, complete set of gauges for 75 m/m shells, hydraulic forming presses, heat treating furnaces, diaphragm producing rig, quick bar cutting machines for 3 in. rounds, small repair plant to handle all automobile repairs. This to include machinery to rebore or grind cylinders, carbon burning, etc., complete plant to produce twist drills and milling cutters. American manufacturers with these items would do well to get in touch with Etienne Roubieu, Tropenas Co., Casa Maua, Sala No. 119, Avenida Rio Branco, No. 9 Rio de Janeiro, Brazil. Three copies of catalogs should be sent.

Canadian Railways Plan Shop Activity

The Canadian Railways through its new president, Sir Henry Thorton, has announced its intention of restoring the big machine shops of the railway system at Moncton, N. B., to increased efficiency. For some months the shops at Moncton have not been working to capacity. Large car orders are expected and the cars will be built at Moncton, where the eastern operating base of the railway is maintained. The Canadian National stretches from the Atlantic to the Pacific and recently absorbed the Grand Trunk Railroad.

Purchasing for Panama

Sealed proposals in triplicate will be received at the office of the purchasing department of the Panama Canal, Washington, D. C., not later than 10:30 o'clock on February 9 for steel black iron, cast steel bearings, water meters, steel bolts and rivets, nails, brass nuts, sheet copper and brass marine boiler furnaces, steel drums, aluminum ware, steel cans, brass valves, liquid door checks, chain hoists, glass, ash cars and other commodities.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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AN ADVANCE of from 12 to 15 per cent in the price of tailor made clothing was predicted by the Secretary of the National Merchant Tailor Designers' Association in session at St. Louis last week, and a telegram from St. Johns, Newfoundland, reports that the extensive iron mines there have been shut down because the German manufacturers who had contracted for their output were no longer able to take it.

These two seemingly unimportant news items are quoted because they connote some tendencies generally discernible. Prices are advancing and production is decreasing in the United States, chiefly because labor is scarce and the buying power of Europe is diminishing as the French occupation of the Ruhr brings nearer the day when the industrial paralysis of Germany may be followed by revolution or war.

If these tendencies are not checked America and Europe will both be drawn into an economic impasse from which they can only escape with great travail, but in the United States at least the anasthesia of advancing prices has made many unconscious of the danger.

The result is that the firmness of most markets is mistaken for prosperity and those who have goods to sell think themselves better off because the money of their customers will buy less than formerly.

It remains to be seen how the ultimate consumer will act when retail prices are raised, as they must be, to a parity with the wholesale markets, but recent history suggests that he may reduce his purchases unless wages and agricultural profits are speedily increased.

That the wage earners intend to make an effort to balance their budgets by getting higher pay is already evident from the demands that are being made by their union leaders, but the farmers and the army of "white collar" workers who are not organized have no such means of protecting themselves and it seems certain that they will be compelled to buy less as the purchasing power of their dollars diminishes.

To write in this strain is distasteful to a tempermental optimist, but I should be recreant to my duty if I expressed myself otherwise. By caution and economy it may be possible for us to minimize the consequences that are otherwise certain to follow the waste of a "near war" in Europe, but we shall indeed be fatuous and foolish if we think we can remain unaffected by it.

Specifically, the week's developments are not otherwise important. The stock market has been comparatively quiet. A small sensation was created by a drop in some of the automobile securities with which the name of a meteoric manufacturer has become associated.

The railway shares were on the other hand in greater favor because it is day by day becoming plainer that government operation or ownership is inevitable unless the consolidations for which the Esch-Cummins bill provides are speedily made. Some of the bolder executives have not hesitated to express themselves in this sense and as it is realized that there are many properties that will be worth more in consolidation than as separate entities speculation has been directed toward the low priced rails upon the entirely tenable theory that they will be most benefited by an alliance with their stronger competitors.

"That the wage earners intend to make an effort to balance their budgets by getting higher pay is already evident from the demands that are being made by their union leaders, but farmers and the army of 'white collar' workers who are not organized have no such means of protecting themselves and it seems certain that they will be compelled to buy less as the purchasing power of their dollar diminishes."

The bond market has been quieter. Since the first of the year it has been called upon to absorb over $800,000,000 of new offerings. Time will be required for the digestion of a meal so large, and a period of dullness is to be expected. There was a slight flurry in "non-taxables" including the Liberty 3½s, when the House passed a bill submitting a Constitutional amendment that would make all securities issued after its ratification taxable, but as the acceptance of any such measure by 36 states is extremely improbable the effect upon the bond market was short lived.

Foreign bonds have been weaker, reflecting the unsettlement in Europe, and the French dollar bonds in particular sold at the lowest price thus far recorded. French, Belgian and German exchange and currencies have likewise declined as might have been expected, but the fluctuations of the mark, which is quoted at about 4½ cents a thousand, have ceased to have any significance.

The latest report of the Reichsbank shows that there are over fourteen hundred billion marks outstanding and it is folly to expect that such an ocean of paper currency can ever be stabilized or controlled.

For this, that or the other reason most commodity markets are higher. Rubber touched 38 cents but has reacted slightly upon the expectation that under the British scheme of price control a larger supply would be made available at the advance. Coffee has advanced as it is coming to be believed that the Brazilian government has sold more than half its holdings. Copper is again at 14¾ cents. Tin has had a sensational advance. Paper and wood pulp are higher because there is a strike in the Swedish pulp mills.

From force of habit cotton has again advanced. Wool is higher and so are woolen goods. The steel industry is active and higher prices for prompt delivery are bid in an effort to stimulate production, which is restricted by the scarcity of labor. Lumber is in good demand at full prices for the same reason. But it is hardly necessary to continue the recital. It is monotonously uniform.

The weekly statement of the Federal Reserve System shows a gain of $3,000,000 in the gold held and a fractional advance in the reserve ratio. which now stands at 76.4 per cent. The changes otherwise are not important.

A continuance of easy money is indicated and a reduction in the rediscount rate is talked of.

The announcement that the Brotherhood of Locomotive Engineers has bought a substantial interest in the Empire Trust Company of New York and is contemplating the establishment of its own bank in this city is an important sign of the times. This Brotherhood already owns a bank in Cleveland that has over $15,000,000 in deposits.

It may be and it is to be hoped that we are approaching an economic millenium in which the gulf between labor and capital will disappear because all those who labor have become capitalists.

A. W. Copeland on Executive Committee

At the recent meeting of the executive committee of the American Gear Manufacturers Association, A. W. Copeland, president of the Detroit Gear and Machine Co., was elected to fill the vacancy on the committee caused by the death of John H. Foote, president of the Foote Bros. Gear and Machine Co., Chicago. Mr. Copeland's membership on the committee will continue until the annual meeting of the association when this position will be filled by election. The Annual meeting of the Association will be held at the Hotel Cleveland, Cleveland, Ohio, on April 19, 20 and 21.

Erratum

Robert Darling was recently elected a director of the Hartford Aetna National Bank of Hartford, Conn. In a recent issue of the *American Machinist* it was erroneously stated that he had been elected a director of the First National Bank of Hartford.

Machinery Exporters Seek Peaceful Markets Says Walter H. Rastall

DURING recent months the European situation has discouraged some of our machinery manufacturers from making an active push for foreign business, says Walter H. Rastall, chief of the Industrial Machinery Division of the Department of Commerce, in an analysis of world machinery markets in the forthcoming issue of *Commerce Reports*. We have had a lot of comment on fluctuations in exchange, depreciated currencies, bolshevism, trade barriers, etc., while the news from other parts of the world has received little attention because most of it was not sensational. Nobody seems to have noted the fact that of the 20 countries leading the list of purchasers of American machinery only three are in Europe while the other 17 are largely free from the troubles resulting from the war. Some of the first fifteen countries have progressed to a point where currency depreciation is less than 5 per cent, and serious fluctuations in exchange, which are far more important than the rate of exchange, have practically disappeared. Reconstruction in these countries has now reached a point where our position will continue to grow better.

In 1921 twenty-nine countries each absorbed more than $1,000,000 worth of American industrial machinery. Mexico stood first with $30,000,000, six times the value of her imports of American industrial machinery in 1913. Canada, which was second in 1921, imported less than in 1913, but late indications point to a considerable increase in 1923. Cuba third in the 1921 list of importers of American industrial machinery, took $21,000,000 worth, about five times as much as in 1913. Japan was fourth, taking machinery to a value of $21,000,000, compared with $3,300,000 in the last pre-war year. China was fifth, with imports of $18,000,000, seventy times as much as in 1913. The United Kingdom was sixth with $18,000,000, a drop of $20,000,000 from 1919. France was seventh, importing $14,000,000 worth of our machinery, about four times as much as in 1913, but a reduction of $24,000,000 from 1919 when reconstruction purchases were at their height. Following came, in the order named, British India, Brazil, Argentina, Philippines, Australia, Dutch East Indies, Peru, Chile, Dominican Republic, South Africa, Colombia, all importing over $2,000,000 worth of our machinery, and none of them in Europe. Spain was nineteenth with $2,500,000, two and one-half times as much as in 1913, but only half of the imports of 1919. New Zealand was twentieth, importing $2,000,000 of American industrial machinery, four times as much as in the year before the war. Of the nine other countries whose imports of our machinery were between $1,000,000 and $2,000,000 in value in 1921 four were in Europe and five outside. All these non-European countries show large increases in American machinery exports over 1913, those of the Dutch East Indies being eleven times as great in 1921 as in 1913 which is an increase worthy of attention.

All the information available indicates splendid opportunities for the sales of American machinery abroad and that it is not wise to pay too much attention to reports regarding Europe where markets are contracting. It is far better to employ constructive sales efforts in the expanding markets of Asia and Latin America and of Canada.

Industries in Midwest in Excellent Shape

According to the United States Department of Labor, industry in the Midwest is in better condition than for several years past. In the states of Illinois, Indiana, Michigan, Ohio and Wisconsin the most active winter season for some time has developed. Unemployment is almost unknown in these states, says the report, and in some centers there is an actual shortage of help. Automobile production in Detroit is unprecedented and there is a shortage in industrial help in that city as well as in other automobile manufacturing centers of the state.

Standards Committee Calls Conference

A conference has been called by the American Engineering Standards Committee for Saturday, February 17 at 9:30 a.m., for the purpose of determining whether a national safety code for the forging industry and a national safety code for plate and sheet metal working shall be adopted. The meeting will be held in the Board Room of the American Society of Mechanical Engineers, 29 West 39th St., New York City.

The conference is called at the request of the Safety Code Correlating Committee. A paper on "Accident Experience in Forging, and Plate and Sheet Metal Industries" will be delivered by L. L. Hall, assistant secretary National Bureau of Casualty and Surety Underwriters. W. H. Christopherson, Deputy Commissioner, New York State Department of Labor will deliver a paper on "Commission Experience with Accidents in the Forging, and Plate and Sheet Metal Industries." S. J. Williams, chairman, Safety Code Correlating Committee will deliver a paper on "National Industrial Safety Codes."

Pan American Conference Invites Secretary Hughes

The Government of Chile has invited the Secretary of State to attend the opening of the Fifth Pan American Conference which is to be held in Santiago in March, 1923. Mr. Hughes has accepted and will attend the opening session if conditions in the United States at that time permit.

The program of this conference contains many subjects of great importance to American manufacturers and commercial interests. It was prepared under the supervision of Secretary Hoover as chairman of the Inter-American High Commission, and adopted officially by the Pan American Union.

The sections which will be watched most closely in the United States are those dealing with the convention covering trademarks and literary or artistic copyright; the Pan American agreement on co-operation in the improvement of air, land and ocean transportation facilities, including regulations covering wireless telegraphy; uniform parcel post procedure; and the promotion of the arbitration of commercial disputes.

Big Meeting Planned by Export Managers

Elaborate plans are being made for the Get-Together Meeting which will be held March 20 at the Hotel Pennsylvania, New York City, under the auspices of the Export Managers' Club. The meeting will be divided into three sessions, morning, afternoon and evening and during these sessions the following subjects will be discussed:

Getting Results from the Sales Budget, Building Sales through Service, Manufacturers Representatives vs. Merchant Distributor, Practical Problems of Marine Insurance, Discounting Drafts vs. Collection, Standardization of Practices. Exceptional men have been obtained to speak on these subjects.

At the morning session, the chairman will be C. J. Warren of the Remington Typewriter Co. and the address of welcome will be delivered by H. P. Rockwell of the Yawman-Erbe Manufacturing Co. The afternoon chairman will be Stanley H. Rose of the Barber Asphalt Co. At the informal dinner in the evening, A. Schoonmaker of the Bourne-Fuller Co. will preside as toastmaster.

Locomotive Repair Record Established

A new record of locomotive repairing was established in the United States when between Dec. 15 and January 1 there were turned out of shops in various parts of the country, 18,724 engines, according to reports filed by the car service division of the American Railroad Association. Reflective of this record was the report that on Jan. 1 there were less locomotives in need of repair.

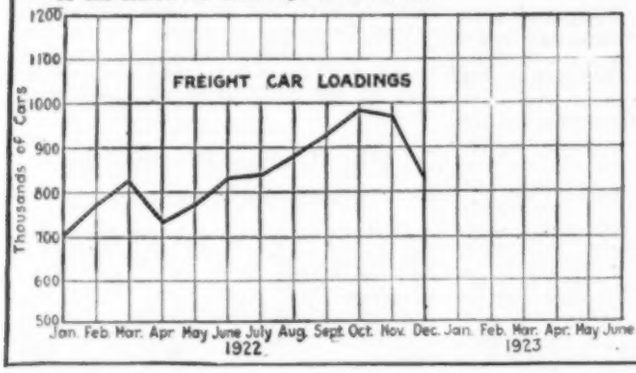
Interesting Talk by Piez

At the annual banquet of the Engineers' Society of Western Pennsylvania held at the William Penn Hotel, Pittsburgh, January 22, Charles Piez, president of the Link-Belt Co., Chicago, delivered a most interesting address under the title of "Some of the Problems of the Day." He touched upon the importance of the engineer in the general scheme of society and the wonderful assistance that had been rendered by engineering societies. He spoke upon the duties of engineers in the political system of the country and urged his auditors to take a larger interest in the questions of the day.

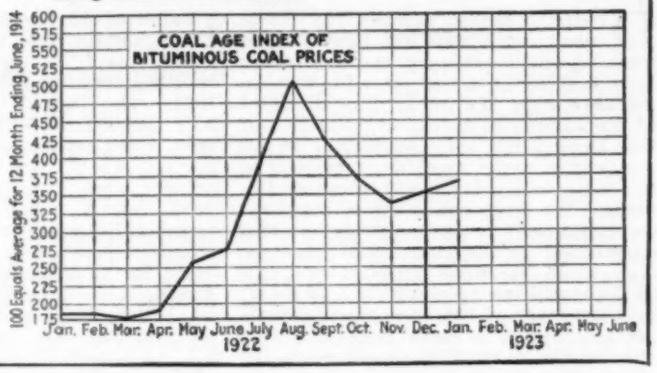
Meeting in Montreal

The Spring Meeting of the American Society of Mechanical Engineers will be held in Montreal, Canada, May 28 to May 31. A trip to Buffalo will precede the meeting and points of interest in the East will be visited by the engineers. Excursions to Quebec and other points north and east of Montreal will be held following the meeting.

Weekly car loadings of revenue freight based on reports from the railroads of the U. S. by the Car Service Division of the American Railways Association.



Coal Age Index of Bituminous Coal Prices, f.o.b. mines, the average of spot prices from July, 1913, to June, 1914, being taken as the base.



FREIGHT car loading during December was a trifle lighter than it has been for some months past, but during January, uncompleted reports showed that rapid strides were again made and that on January 13 records for some time were broken. As compared with January 1922 there was an increase of 159,060 cars. The entire month of December showed a decided gain over the same period of 1921 and the greatest height was reached during the week of December 9 when the figures showed that 919,928 cars were loaded. Both November and October proved to be exceptionally big months. It is expected that car loadings will increase during the coming month.

Automobile production during December showed a slight decline as compared with November and October of the same year. But for the entire year an increase of good proportions was shown by the reports and, according to the Department of Commerce, the output was nearly doubled. During 1922 there were manufactured 2,334,171 passenger cars and 243,049 motor trucks, and when the December production is compared with December 1921 it shows that the increase is nearly 300 per cent. Authorities in the automotive field predict that the future will see further growth and that the present excellent volume of production will not be diminished to any extent unless unforeseen obstacles are encountered during the present year. Plans are being made by manufacturers for an exceptionally profitable year.

Comparative Prices of Shop Supplies

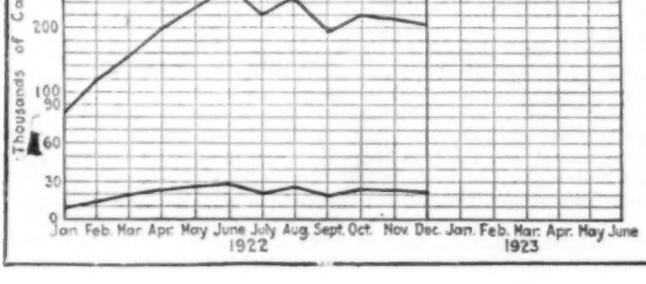
Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.....	$0.030	$0.0295	$0.0271
Cold finished shafting.....	per lb.....	0.0385	0.0378	0.0333
Brass rods.....	per lb.....	0.1742	0.171	0.155
Solder (½ and ¼)	per lb.....	0.2425	0.24	0.2075
Cotton waste..	per lb.....	0.1175	0.11	0.106
Washers, cast iron (½ in.)...	per 100 lb.	4.33	4.33	3.65
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100.....	2.96	3.11	3.11
Lard cutting oil	per gal.....	0.5583	0.59	0.76
Machine oil....	per gal.....	0.36	0.36	0.40
Belting, leather, medium.....	off list.....	49%	30-10% @50%	46%
Machine bolts up to 1 x 30 in.	off list.....	51⅓%	55% @60%	64⅓%

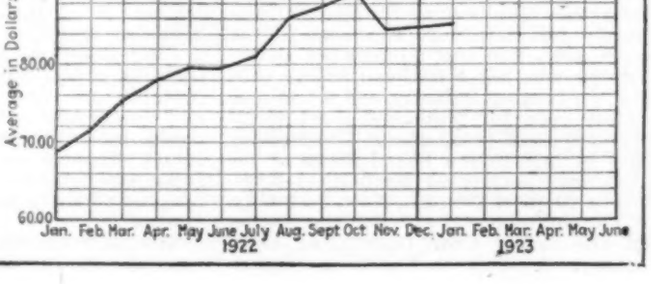
Coal Age Index of Bituminous Coal Prices is this month placed at 365 which is an increase over that of the same period last month and also of the month before. From the middle of August up until the middle of November a sharp decline was effected on the chart, but during the past two months increases are to be noted, neither of particular importance but still indicative of the general trend. Seasonal causes are assigned to part of this increase and also the dirth of anthracite coal in the big markets. Predictions for the future are being cautiously made due to the existing circumstances.

Fifty Stocks averaged for the month from December 15 to January 15 shows an increase over the average for the same period during the preceding month and in a much more healthy state than during the thirty days dated from October 15 to November 15. Stocks generally seem to have steadied down perceptibly except in a few instances where violent fluctuations are being felt. Activity in the markets is about normal and brokers report that purchasers seem more willing to take safe securities and to let the speculative stocks run their course. Recent manipulation of stock in Wall Street in which Durant, Fisher Bodies and General Motors were frequently mentioned was regarded by many as more or less of a family affair in which outsiders should stay out side. Profit-taking was frequent during December and early part of January.

Passenger cars and trucks, production based on figures compiled by the Bureau of Foreign and Domestic Commerce. Average for 1919, 138,138 cars; 26,364 trucks.



New York Times Annalist combined average price of 25 railroad and 25 industrial stocks based on weekly averages of last sale in each week.



News of Washington Activities

By Paul Wooton

WITH MORE than his usual earnestness, Commerce Secretary Hoover made a plea for unity among engineers in the course of remarks at a luncheon tendered Charles F. Loweth, the new president of the American Society of Civil Engineers, at Washington, on January 23. Secretary Hoover declared that the civil engineers should not raise secondary questions when that course interferes with engineers as a whole doing their full duty to the country.

As a result of the inadequacy of transportation, the public is being driven into a clamor for public ownership of the railroads, he pointed out. It even may be an issue in the next campaign, he predicted. Mr. Hoover declared that he is against this proposition and said the country is not within 200 years of the time when such an undertaking could be handled successfully.

The Federated American Engineering Societies is not in a position to throw the weight of its influence into the study of the transportation problem because of the failure of the civil engineers to co-operate, he said. As a result the country is confronted with a situation of utmost gravity and the engineers are not united to urge its solution along sane lines. The only ones in contact with the situation in Washington are those who are interested on either one side or the other, he continued.

The Government, Secretary Hoover said, is the applied science of economics. Engineers have not taken that fact into sufficient account, he said, as the dominating thing in engineering today is the interpretation of economic forces, yet the profession is not a unit in Washington, the point from which their efforts in the national welfare must go forth.

Better Salaries for Professions

An executive order may have to be issued to provide an adequate scale of salaries for professional positions in the Government service. Congress has wrestled with this question for more than two years, and now as the session is about to close, the reclassification legislation seems to be jammed hopelessly. It is just possible that Congress, on learning that the President is prepared to meet this situation by an executive order, may compromise their differences and provide the long-needed legislation.

If an executive order is issued, it is believed the scale would be cut about as follows: Chief Professional, $7,500 and up; full professional, $5,700 to $7,500; associate professional, $4,500 to $5,700; assistant professional, $2,460 to $4,500; Junior professional, $1,860 to $2,460. The Brown report on reorganization now is promised for Feb. 1.

No Change in Statistics Locale

After a careful study of the manner in which import and export statistics are being collected, Commerce Secretary Hoover has decided to continue to compile those figures in New York. Legislative authority recently was given which enabled the transfer to this statistical work from the Treasury to the Commerce Department. The same law authorized the Secretary of Commerce to consolidate the Bureau of Customs statistics in New York with the Bureau of Foreign and Domestic Commerce and to transfer the work wholly or in part to Washington.

Tax-Exempt Securities

With seven votes to spare, the House of Representatives on January 23, rather unexpectedly, passed the joint resolution proposing an amendment to the constitution of the United States intended to prevent the issuance of tax-exempt securities. The belief is quite general on Capitol Hill that the approval of the joint resolution cannot be secured at this session of Congress in the Senate. This would have the effect of allowing the legislation to die with the session of Congress which ends March 4, thereby making it necessary for the House of Representatives to reconsider the measure at the next session. Even were the Senate to pass it before March 4, many are of the opinion that great difficulty will be experienced in securing the ratification of the amendment by two-thirds of the states.

Income Tax Wrangle Again

Deduction of capital losses in excess of twelve and one-half per cent is precluded by legislation likely to be adopted at this session of Congress. The proposal is to amend the revenue act of 1921 so that a tax payer may not be allowed a complete deduction of capital losses incurred. Both the revenue acts of 1918 and 1921 have left this gap through which many have escaped from income taxes.

It is pointed out that an injustice is done the taxpayer in that an increment frequently accumulated over a period of many years is taxed at a high surtax rate when the property is converted into cash in a given year. The net profit is arbitrarily attributed to the year in which the sale took place. In addition there was a severe restraint on sales at a profit. Many transfers of property were prevented when the transfer was highly desirable from the standpoint of economic development.

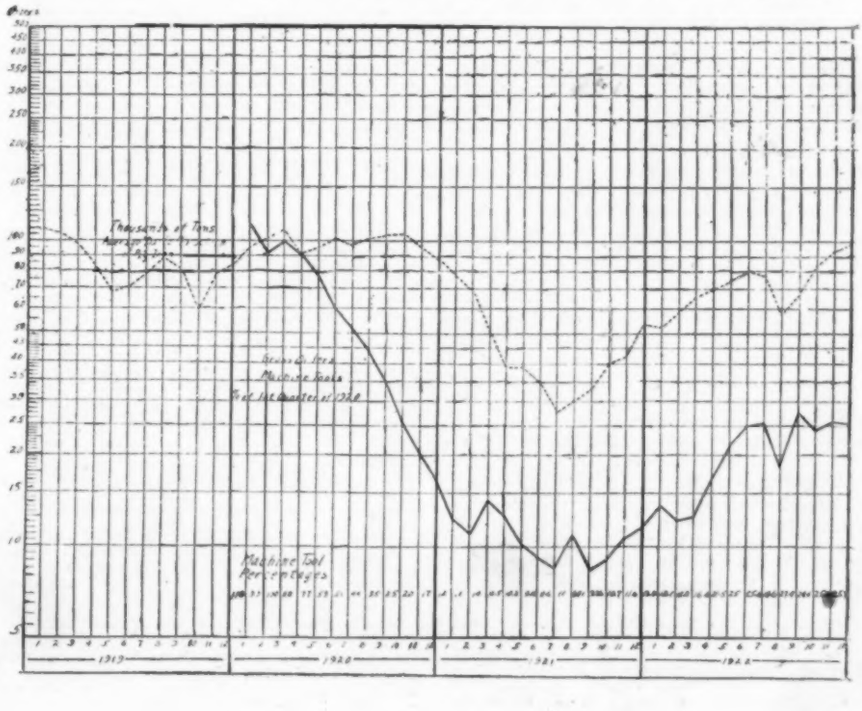
The act of 1921 provided that the tax on capital gains in the case of property acquired and held by the tax payer for profit or investment for more than two years should be limited to twelve and one-half per cent, but no such limitation was placed on capital losses.

Much Interest in Silver Mining

That more than mining engineers are interested in legislation proposing to study the situation which will overtake silver mining when the Pittman Act expires is indicated by a communication received by the Senate committee on mines and mining from the Federated American Engineering Societies. The committee on mines and mining is considering legislation proposing to set up a congressional committee, along the lines of the Committee on Agricultural Inquiry, to study the silver, and possibly the gold, situation.

Activity of Machine Tool Industry As Compared with Pig Iron

THE accompanying chart shows the relation between the activity in the machine tool industry, as indicated by gross orders received, and the production of pig iron. The figures for machine tools run back only to the beginning of 1920 which is unfortunate as it takes as "normal" the average of the three best months in the history of the industry. The depth of the depression is thus greatly exaggerated. Note the way the two curves follow each other.



Business Items

An extensive production plan has been outlined by the Globe Malleable Iron and Steel Co., Syracuse, maker of the Elmer engine which will be marketed as a small portable engine for farm work. The engine involves a new principle for cracking oil for combustion.

A company is being formed at Syracuse, N. Y., for the manufacture of a new shoe shining machine to be known as the Radio Shine machine. John L. Hubbard, foreman of the Syracuse Pattern Works is the organizer.

The Century Electric Co., St. Louis, Mo., single and polyphase motors, has opened a branch office at 603 Queen and Crescent Bulding, New Orleans, La.

The following directors were elected at the annual meeting of the Visible Pump Co., Findley, Ohio: H. W. Powell, W. A. Hollington, W. F. Hosler, David Kirk, H. Fort Flowers, Don Hetrick, all of Findley, and C. S. Fair, William Roth and H. E. Dean of Fort Wayne, Ind.

The following officers have been elected for the Delphos Ice-machine Co., Delphos, Ohio: President, O. H. L. Leilich; vice-president, Henry Genmke; secretary and treasurer, L. C. Allinger, and general manager, R. D. McCree.

The Ohio Pumping Machine Co., is building a new factory at Akron, Ohio, and has elected the following directors: George W. Crouse, William Bousche and J. M. Summer.

The Chapin Skelton Corp., Syracuse, steam garment pressers, has elected the following new directors: Albert McChesney, Louis Will, Howard P. Denison, Windsor Morris, Clifford Searl, Edward H. O'Hara, Edward H. Dann, Orville H. Green, E. I. Chapin, C. E. Besanson, Joseph W. Dawson, Edward N. Trump and T. H. Halstead.

Johnson & Bassett, Worcester, Mass., spinning machinery, has changed its name to Johnson & Bassett, Inc., and has been incorporated with a capital stock of $225,000. The following officers have been elected: President and treasurer, George M. Bassett; vice-president and general manager, Chester E. Williams; secretary and assistant treasurer, C. D. Kelly; sales manager, William E. Ahearn.

The Hanna Engineering Works, 1765 Elston Avenue, Chicago, riveting machines, air hoists, sand sifters, molding machines and sprue cutters, are now represented in Detroit, Mich., by the Charron Engineering Sales Co., 1002 Real Estate Exchange Building.

The Bassett Metal Goods Co., Derby, Conn., metal products, has elected the following officers: President, F. A. Russ, Greenwich, Conn.; treasurer, B. H. Faulkner, Montclair, N. J.; secretary, J. B. Russ, Huntington, Conn.

The Blakely Manufacturing Co., Detroit, has moved to a new factory building at Fullerton Avenue, Monnier Road and Hartwell Boulevard. The factory is located on a two acre lot and contains 12,000 sq.ft. The company makes steel fastenings for holding automobiles in position while being shipped on freight cars.

The Ohio Elevator & Machine Co., Columbus, Ohio, has been reorganized following the death of its former president, J. H. DeVere. The following officers have been elected: Lowry E. Sater, president; J. H. DeVere, vice-president; A. H. Thomas, secretary and H. B. Burton, treasurer and general manager.

The following directors have been elected for the Buckeye Traction Ditcher Co., Findley, Ohio: Ralph W. Moore, W. F. Hosler, W. A. Hollington, C. D. Hayward, A. C. Heck, C. A. Gasterline and N. L. Maclachlan.

One of the largest contracts ever given an Alliance, Ohio, firm has been secured by the Alliance Machine Co. from the Virginia Railroad Co. This contract is for the equipment of the coal handling machinery at the terminal of the Virginia Railroad at Norfolk, Va. It is estimated that the contract involves an expenditure of $1,250,000.

Trade Catalogs

Sand Blasting Machines. The Pangborn Corporation. A new four page folder has been issued by this concern showing the various models of sand blast machines and illustrated with half tones and diagrams. The text is printed upon blue and is made in the form of a letter.

Tools. The Consolidated Tool Works, Inc., New York City. Catalog "D" has been issued by these works and contains descriptions and illustrations of saws, bit braces, hand planes, hand drills, breast drills and jaw chucks, calipers, tap wrenches and tap bolders, micrometers and other tools.

Recording Scleroscope. The Shore Instrument and Manufacturing Co., Jamaica, New York. The Scleroscope Model D Recorder is illustrated, diagrammed and fully explained in this catalog.

Valves. Golden Anderson Specialty Co., Pittsburgh, Pa. In a catalog entitled "The Safety Age" valves of all kinds made for the purpose of protection against water damage and other injuries, are fully described and illustrated with diagrams and silhouetted half tones.

Motors. The Louis Allis Co., Milwaukee, Wis. The company has recently issued a catalog describing its new L-A motors, type HD. Two-color process has been used in printing the catalog and all of the parts of the new motor are shown and thoroughly described.

Pneumatic Safety Rivet Buster. The Independent Pneumatic Tool Co., Chicago, Ill., and New York City. This company has recently issued a circular on the Thor Pneumatic Safety Rivet Buster. Specifications are given as well as text and diagrammed illustrations.

Electric Grinders. The Cleveland Armature Works Co., Cleveland, Ohio. Medium duty Electric Grinders are described and illustrated in the catalog issued by this company.

Transmissions. The Driscoll Transmission Corp., New York City. Variable speed transmissions are explained in a most attractive booklet issued by this company.

Chucks. The J. M. Ney Co., Hartford, Conn. The chuck with the unbreakable grip is described at length in the new catalog issued by this company. Excellent illustrations accompany the text.

Angle Plates. Boston Scale and Machine Co., Boston, Mass. A circular describing the Universal Angle Plate and a recent price list has just been issued.

Obituary

RICHARD W. PRATT, aged 91 years, died recently at his home, Boston. Mr. Pratt was the oldest machinery dealer in Boston and was frequently called upon for expert testimony in regard to the installation of machinery.

GEORGE H. HULETT, aged 77 years, died recently at his winter home, Daytona, Fla. Mr. Hulett's home was in Cleveland and he was the inventor of many ore scoops and conveyors for use in loading and unloading lake vessels. He was a member of Cleveland Engineering Society and the American Society of Mechanical Engineers.

JOHN F. GEARY, well known foundryman and radiator specialist, died recently at his home, North Tonawanda, N. Y.

Pamphlets Received

Dermatosis Following the Use of Cutting Oils and Lubricating Compounds. Issued by the Treasury Department, United States Public Health Service, and written by William J. McConnell.

The Leipzig Fair. An illustrated pamphlet printed in English describes the forthcoming Leipzig Fair which will be held August 26 to September 1.

An Investigation of the Properties of Chilled Iron Car Wheels. Seventy-two page booklet with illustrations, charts, graphs and tables issued by the Engineering Experiment Station of the University of Illinois.

Tenth Annual Report of the Secretary of Commerce. Official report for 1922 divided into various departmental chapters and consuming 231 pages. Issued by the government.

Annual Report of the Director of the Bureau of Foreign and Domestic Commerce for the fiscal year ending June 30. The report is official and made by Julius Klein, the director. Issued by the government.

General Specifications for Electric Overhead Traveling Cranes. Heavy Duty Steel Mill Service. Interesting pamphlet with room in back for notes issued by the Association of Iron and Steel Engineers, Pittsburgh.

The International Aero Exhibition. Announcement in booklet form of the forthcoming exhibition to be held in connection with the Gothenburg, Sweden, Jubilee Exhibition, May 8 to September 30.

Office Managing is New College Course

At New York University, New York City, a new course of instruction on how to keep employees happy, healthy and also well satisfied has been added to the curriculum of the Department of Business Management. Methods of efficiency will be presented to the students of office and factory management.

The course will be known as the "Labor and Employment Management" course and will be presented under the direction of J. S. Hackett for the first time at the second semester commencing Feb. 4. Accident and fire prevention, management of medical departments, the use of emergency hospitals, sickness prevention in industrial plants, hygiene, sanitation, ventilation, fatigue, lighting and heating, lunchroom and food for workers, wages and wage systems, employee representation, profit sharing and life insurance are among the subjects that will be covered by the course.

Personals

CLARENCE J. WETSEL, formerly general manager of the Bausch Machine Tool Co., Springfield, Mass., and later secretary and treasurer of the Van Norman Machine Tool Co., has been appointed sales manager of the Henry & Wright Manufacturing Co., Hartford, Conn.

GORHAM C. PARKER has taken over the business of the Parker Arbor Co., Ann Arbor, Mich., and will continue in the same location.

H. G. SMITH has been appointed vice-president in charge of sales for the Bethlehem Shipbuilding Corp., Ltd., of Bethlehem, Pa. His headquarters will be at 25 Broadway, New York City.

FRANK WALKER, superintendent of the Bessemer department of the Republic Iron and Steel Co., Youngstown, Ohio, has resigned to become operating head of the new mechanical puddling plant of the Youngstown Steel Co., now in the course of construction near Warren, Ohio.

HOMER L. RANK will become the sales manager of the Holbeck Pulverizing systems for the Bonnet Co., Canton, Ohio. The company makes coal pulverizers and clay making machinery.

T. E. SELLEN has resigned as assistant manager of the Griscom-Russell Co., Massillon, Ohio.

JONAS KAUFMAN, president of the Standard Wire Co., New Castle, Pa., has announced that the Buckeye Register Co., Warren, Ohio, has been acquired by his company. The machinery will be moved from Warren to New Castle.

HOMER M. SILVER has retired as superintendent of the Silver Manufacturing Co., Salem, Ohio. Mr. Silver has been with the company for the past 43 years, the last seventeen as superintendent.

C. M. STEVENSON has resigned as district sales manager at Toledo, Ohio, for the Colonial Steel Co., Pittsburgh, and has been elected a director and appointed general manager of the Reinforced Switch and Manufacturing Co., Pittsburgh.

JOSEPH WELSH has been appointed superintendent of the Bessemer department of the Republic Iron and Steel Corp., Youngstown, Ohio, succeeding Frank Walker, resigned.

FRANK CUNNINGHAM has been made general superintendent of the Bessemer and Brown Bonnell mills of the Republic Iron and Steel Co., Youngstown, Ohio.

A. A. FAFLICK, business manager of the Dostal Products Co., Bucyrus, Ohio, has resigned to accept a position in the sales department of the Marion Steam Shovel and Dredge Co., Marion, Ohio.

LEO WISEMAN has been transfered from the main office of the Youngstown Sheet and Tube Co., Youngstown, Ohio, to the New York office of the company. Mr. Wiseman was in the auditing department.

H. A. HUTCHINS, formerly connected with the Thew Shovel Co., Lorain, Ohio, has become associated with the main office staff of the Northwest Engineering Co., Detroit, Mich. Mr. Hutchins had been wth the Thew Co. since 1917, part of that time as district manager in the Chicago territory.

PAUL NORTON, president of the Case Crane and Engineering Co., Columbus, Ohio, has been named president of the Kilbourne-Jacobs Co., Columbus, Ohio. Howard Hileman has been elected vice-president of the new company and Clyde Roth secretary.

JOHN M. HENRY, for several years publicity manager for the Pratt & Whitney Co., Hartford, Conn., has accepted a position in a similar capacity with the Penton Publishing Co., Cleveland, Ohio. Mr. Henry has been identified with the machinery business for several years, having been employed by the H. H. Manufacturing Co., New Britain, Conn., and the Hart & Hutchinson Co., New Britain, Conn., besides having been with the Pratt & Whitney Co.

J. W. ANDERSON, who has been connected with the Manning Abrasive Co., Chicago, for nearly five years, will take charge of the Cincinnati branch of the same firm.

ALFRED J. DOUGHTY, formerly factory manager of the Burroughs Adding Machine, Co., Detroit, was recently elected to the Board of Directors and made vice-president of the company. He will be in charge of all factory and mechanical operations of the company.

PROFESSOR E. P. WARNER of the Massachusetts Institute of Technology has been elected chairman of the Aeronautic Division of the A.S.M.E. to succeed Major Thurman H. Bano, resigned.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Machinery and equipment for cotton ginning, and cotton seed oil production. South Africa. Agency. Quotations f.o.b. New York. Reference No. 5143.

Machinery for the manufacture of glycerin from the refuse of sugar molasses produced from 140 tons of can daily. Mexico. Purchase. Quotations c.i.f. Manzanillo, or f.o.b. New York. San Francisco. Payment: cash. Reference No. 5146.

Builders' and contractors' machinery and implements, concrete mixers, and excavators. Poland. Purchase and agency. Quotations, c.i.f. Danz'g. Correspondence German or Polish. Reference No. 5152.

Vulcanizing machinery of medium price. Hungary Purchase and agency. Quotations c.i.f. Hamburg. Terms, cash against document. Reference No. 5153.

Complete cotton ginning plant and oil crushing equipment including three 80 saw gins, and decorticating and pressing equipment. South Africa. Plant to handle approximately twice as much material for oil pressing as for ginning. Purchase. Quotations f.o.b. New York. Reference No. 5133.

Looms for carpet weaving. Scotland. Purchase. Quotations should be on weft looms, f.o.b. New York, Philadelphia or Baltimore. Terms: cash against documents. Reference No. 5134.

Cotton mill machinery, including carding machines, cloth-folding machines and cloth-calendering machines, to be operated by hand and power. India Catalogues and prices desired. Reference No. 5137.

Air compressors, pneumatic tools, including different types for sand blast; and cement mixers for construction purposes. Italy. Agency. Correspondence, French or Italian. Reference No. 5142.

Machinery for foundries, for bronze and pig-iron work; for wood working for machine shops, for making bolts, nuts and wire products, for making iron beds, presses of all types, oxygen apparatus, etc. Bulgaria. Purchase and agency. Quotations c.i.f. Bourgas. Correspondence German. Reference No. 5147.

Machinery for repairing and reinforcing automobile tires. Spain. Purchase. Quotations f.o.b. New York, Correspondence Spanish. Reference No. 5085.

Threaded iron tubes, fine plates, three tenths millimeter to one millimeter thick, dimension, one by two meters; pigs of zinc and first fusion pipe fittings. Italy. Purchase or agency. Quotations, c.i.f. Genoa. Reference No. 5091.

Machinery for cutting, printing, sterilizing, waxing, and packing in paper cylinders 500 milk bottle disks and white wood pulp board suitable for milk bottle stoppers. New Zealand. Purchase. Quotations c.i.f. New Zealand port with f.o.b. value for customs purposes. Terms: Cash against documents at port of delivery. Reference No. 5102.

Hardware, machinery, automobile accessories, etc. Australia. Agency. Reference No. 5108.

Spraying machines, both hand and power. South Africa. Purchase. Quotations, Cape Province port. Terms: cash against documents. Reference No. 5114.

Forthcoming Meetings

National Automobile Chamber of Commerce, National Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

American Institute of Electrical Engineers, Mid-Winter Meeting, February 14 to 16, Engineering Societies' Bldg., New York. F. L. Hutchinson, Secretary.

American Society for Steel Treating, Winter Sectional Meeting, City Club, Chicago, Ill., February 8 and 9, 1923. National Secretary, W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio.

Universal Patent Exposition, First Annual Convention and exhibit of patents and inventions, Grand Central Palace, New York City, February 17 to 22, 1923. A. B. Cole, 110 West 40th St., New York City, is chairman.

American Institute of Mining and Metallurgical Engineers. Annual Meeting, February 19 to 21. Engineering Societies' Bldg., New York. F. S. Shartless, Secretary.

Philadelphia A.S.M.E. and **Philadelphia A.I.E.E.**, Joint meeting February 27 at the Philadelphia Engineers Club. Afternoon, dinner and evening sessions. Louis H. Kenney, Meetings committee, U. S. Navy Yard, Philadelphia, Pa.

Society of Industrial Engineers, Spring convention at Hotel Gibson, Cincinnati, Ohio, April 18 to 20. Secretary, George C. Dent, 327 South La Salle St., Chicago, Ill.

American Gear Manufacturers' Association. Seventh annual meeting April 19, 20 and 21, Hotel Cleveland, Cleveland, Ohio.

National Foreign Trade Council. Annual meeting at the Grunewald Hotel, New Orleans, La., April 25 to 27, 1923. O. K. Davis, Secretary, 1 Hanover Square, New York City.

American Foundrymen's Association. Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago, is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society for Testing Materials. Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

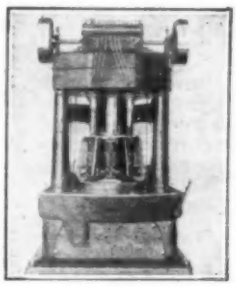
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Tapping Machine, Horizontal Spindle, Automatic, No. 10.
Burke Machine Tool Co., Conneaut, Ohio.
"American Machinist," November 30, 1922

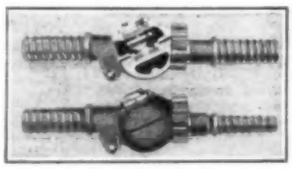
The machine has a capacity from ⅛ to ½ in. in steel, and can be run at very high speed. The use of relieved taps is recommended. The machine is driven by a constant-speed belt, and may be run directly from the lineshaft, or a countershaft giving three speeds can be provided. Power feed is used when driving the tap while cutting. When the machine automatically reverses, it backs the tap out at twice the forward speed. A Skinner positive-drive tap chuck is regularly furnished, as well as a pump and tank for supplying lubricant to the taps. The table is fully universal and fitted with a T-slot for attaching jigs. A faceplate also is furnished to fit on the drawbar in place of the table.

Boring Machine, Multiple Spindle, Cylinder
Manufacturers' Consulting Engineers, McCarthy Bldg., Syracuse, N. Y.
"American Machinist," November 30, 1922



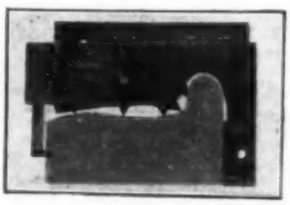
The machine is for boring gas-engine cylinders and finishing the head at one end of the bore. The five spindles in the machine do not move axially, but have only rotary motion. The work is mounted in a rotating fixture having six positions, five working positions and one for loading. Three separate cuts are taken for boring, and two for finishing the head of the cylinder, all simultaneously. The work holder and work are fed upward to the cutting tools by a cam giving a quick return, a quick approach, a uniform boring speed, a reduction in feed for machining the head of the cylinder and a dwell for the final finishing of the head. The machine is semi-automatic. It is belt driven, with the driving pulley on top of the spindle head. Height, 8 ft. 2 in. Base, 5 ft. square.

Coupling, Air-Hose, Automatic
Robinson Machine Co., 39 Eighth St., Muskegon, Mich.
"American Machinist," November 30, 1922



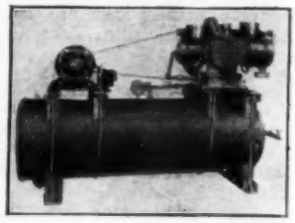
The purpose of the coupling is to prevent loss of air in the supply line when adding or removing lengths of hose. The half of the coupling that is connected to the supply line is provided with an automatically operated check valve, which operates as soon as the coupling is parted so as to retain the air pressure. Tools may be changed by simply uncoupling and coupling at the work. When making a connection, the hook on the hose half of the coupling is placed under the pin on the line half. The coupling is then pushed together and clamped by means of an eccentric ring that can be turned either way from the center. When desired for pipe lines, the line half of the coupling can be equipped with a threaded nipple. The coupling is made interchangeable in ¼ and ⅜ in. pipe and hose sizes.

Gage, Wheel-Tread, A. R. A.
Pratt & Whitney Co., 111 Broadway, New York, N. Y.
"American Machinist," November 30, 1922



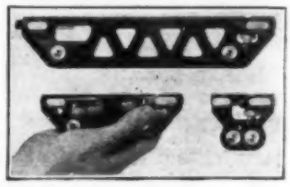
The gage is for measuring steel railway wheels when about to restore the proper contour to the tread. The face is held in contact with the wheel, the central pointer is put in contact with the tread, and the hook on the bar at the right is placed in the groove provided in the wheel to indicate the limit of wear. The four sliding pointers are brought in contact with the wheel and flange. The gage can then be removed for reading. The sliding front plate is moved downward until its lower edge coincides with the lowest point of the four sliding pointers. The scale on the right indicates the amount of metal that must be removed in order to restore the standard contour. The scale on the small bar projecting at the right shows the amount of service metal that will remain after the contour has been restored.

Compressors, Air, Ball-Bearing, Duplex and Two-Stage
Baker-Hansen Manufacturing Co., Alameda, Cal.
"American Machinist," November 30, 1922



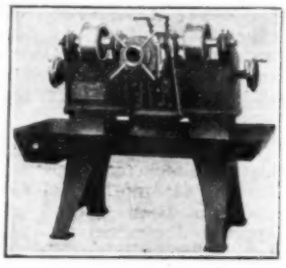
Both the duplex and two-stage machines can be furnished with capacities of from 5 to 50 cu. ft. of air per minute. Both pistons are cast integral with a bar that passes from one cylinder to the other. A small connecting link is pivoted at one end on one piston, and runs on the ball-bearing crank at the other. The ring type of valve has an automatically operated diaphragm. An unloader is provided so that the machine can be started without load. A pressure switch of the two-pole type having a one-piece diaphragm is used. The compressor and the motor are mounted on cast-iron bases, bolted to channel iron and placed on top of the tank. Belt drive is employed. The two-stage compressor can be furnished for operation by either 1- or 5-hp. motors and with tanks of different sizes.

Gage, Pin, Adjustable-Limit
Pratt & Whitney Co., 111 Broadway, New York, N. Y.
"American Machinist," November 30, 1922



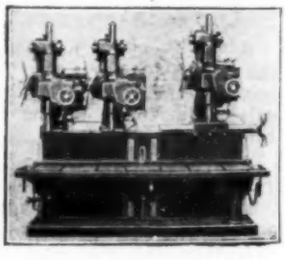
The pin gage is for making internal measurements. By means of its adjustable limits it combines a Go and a No-Go gage in one unit. Two spherical-ended hardened steel pins are carried in a cast-iron frame. The frame is built similarly to a bridge truss to combine lightness and strength. One pin can be adjusted to give any size within the range, by means of opposed setscrews which lock the pin firmly in position when tightened. The opposite pin works between two stops, one of which is adjustable to give limits from 0.001 to 0.025 in. The adjustment may be sealed. Four removable brass disks provide space for marking sizes and other necessary information.

Milling Machine, Duplex, Valve
Acme Machine Tool Co., Cincinnati, Ohio
"American Machinist," November 30, 1922



The machine is equipped with two opposed spindles and is especially adapted for milling steel or brass straight and tapered squares or flats, such as are necessary to give the grip for the wrench on the bodies of valves. The two spindles are independently driven from a plain countershaft and two speeds can be provided. The heads are arranged to swivel. The work-holding fixture is opened and closed by the four-pronged handle. After the work has been clamped, the entire chuck is free to revolve and is arranged for indexing and clamping to four positions. The motion of a long lever gives the work-holding slide its vertical movement and causes the work to pass between the milling cutters, thus milling two sides simultaneously.

Drilling Machine, Gang, Special
Consolidated Machine Tool Corporation of America, 17 E. 42nd St., New York, N. Y.
Colburn Machine Tool Plant, Cleveland, Ohio.
"American Machinist," November 30, 1922



The drilling machine has longitudinal movement of 27 in. for one of the heads. The two other heads are attached to the machine on the left side of the column with a fixed center distance between them. The machine may also be arranged with two or four heads. Each head can be operated independently. The drive is by belt to a constant-speed pulley on each head. For motor drive, a ball-bearing countershaft near the floor is geared directly to the motor. Two mechanical speed changes are provided, and removable change gears furnish 50 spindle speeds from 40 to 500 r.p.m. There are 32 feeds from 0.006 to 0.109 in. per revolution.

Clip, paste on 3 x 5-in. cards and file as desired

New and Enlarged Shops

Machine Tools Wanted

Calif., Napa—F. Goetze—machine shop equipment.

Calif., Oakland — Straub Mfg. Co., 507 Chestnut St., J. R. Kueneman, Supt.—used metal planer, 24 x 24 in. x 6 ft. or larger; radial drill press; compressors; drop hammer; engine lathes.

Colo., Haxtum — C. White — jeweler's power lathe, drill press, bench vise and hand tools.

D. C., Wash.—A. L. Flint, Genl. Purch. Officer of the Panama Canal, Wash., D. C. —receiving bids until Feb. 10, for screw-cutting lathe, pipe fittings (black, galvanized and brass), valves, electrical fixture cable and sheathing copper.

Ill., Chicago—J. Paidar, 1214 North Wells St., (machine shop)—2 spindle boring machine.

Ind., Indanapolis—Stanworth Tool Mfg. Co., 40 West North St., A. Stanworth, Genl. Mgr.—machinery for the manufacture of boring machines, etc.

Kan., Junction City—C. P. Duvay—machinery for proposed $25,000 service and repair station.

Kan., Kansas City — J. A. Combs, 713 Quindaro Ave.—machinery, including lathes for proposed $10,000 garage and machine shop.

Ky., Louisville—F. Good, 3006 4th St.—complete garage equipment, including power drill press, lathe, emery stand, belting, hangers, pulleys, motor and hand tools.

Md., Baltimore—R. W. Judick, 132 Wilkins St.—pipe cutting and nipple machine.

Mich., Detroit—Cadillac Mchy. Co., Lafayette and Beaubien Sts.—60 in. vertical boring mill, King preferred; 42 in. slotter, (new or used).

Mo., Kansas City—Machine Shop, 1624½ Wyoming St.—power punch, lathe and milling machine.

N. Y., Carthage—Bruett-Duffer Co., Inc., (manufacturer of ice cutting machinery)—bench miller, vertical post drill and 1 to 2½ ton triple geared hoist.

N. Y., Ithaca—J. B. Lang Engine & Garage Co., 115 East Green St.—equipment for proposed addition to service and repair works.

N. Y., Lockport—Crose & Leary—lever shears, heavy rolls and punch for $\frac{5}{16}$ in. sheet iron.

N. Y., Ogdensburg — Payne Hardware Co., Ford St., C. Payne, Secy.—sheet metal working machinery and equipment, electrically driven.

N. Y., Ogdensburg—Standard Shade Roller Co., H. M. Wheaton, Mgr.—automatic turning lathes for wood rollers.

N. Y., Ripley—R. Miller—garage and machine shop equipment.

N. Y., Rochester—Max Motor Co., 160 East Ave.—equipment for proposed service station on Court and Chestnut Sts.

N. Y., Watertown — Raybestos, Brakes, Savers Co., 260 State St., (repair station for truck and bus brakes), C. A. Peck, Otis Bldg., Purch. Agt.—18 in. lathe and one portable electric drill, 110 volt.

N. Y., Watertown — Watertown Transportation Co., Inc., Haley St., (bus line), W. Gould, Traffic Mgr.—one vertical drill press (new or used).

O., Columbus — L. McPhail, 207 East Broad St.—one drill press and one medium size lathe.

O., Columbus—Ninth Capitol Garage, 106 Cleveland Ave., C. A. Tippy, Mgr.—one lathe.

O., Columbus—No-Liquid Door Check Co., 209 South High St., C. G. Geyer, Genl. Mgr.—one turret lathe, one drill press and several automatic machines.

Pa., Erie—Watson-Peck Co., State St.—garage and repair shop equipment.

Pa., McKees Rocks—Pressed Steel Car Co., J. B. Tate, Purch. Agt.—four car wheel boring mills and four heavy duty axle lathes.

Pa., Phila.—F. J. Roberts & Co. (Engrs.), Real Estate Trust Bldg.—four roll lathes for export.

Pa., Sharon—A. J. Fulton, North Main Ave.—machinery, tools and equipment for repair shop.

Tex., Dallas—Egan Printing Co., 912-14 Ross Ave., A. Egan, Purch. Agt.—lathe, 5 ft. bed, 24 to 36 in. center, about 11¼ in. swing.

Wis., Darlington—A. C. Poole—automobile repair machinery and equipment for proposed garage.

Wis., La Crosse—Cameron Motor Car Co., 127 South 6th St.—repair machinery and air compressor for proposed garage.

Wis., Milwaukee—East Side Body Repair Co., c/o E. J. Boehler, 908 Hadley St.—sheet metal machinery.

Wis., Milwaukee—Milwaukee File & Rasp Co., c/o H. F. Seefeld, 45 2nd St., (manufacturer of steel files, etc.)—additional tools and machinery.

Wis., Racine—The city, C. Ryba, Clk.—equipment for proposed service and machine shop.

Wis., Stevens Point—R. E. Newby Auto Co., c/o F. Spalenka, Archt., 426 Normal Ave.—repair shop machinery, also gasoline storage tank and pump for proposed $45,000 garage.

Wis., Sturgeon Bay—Lakeshore Motors Co., R. Herbold, Mgr.—equipment for proposed addition to machine shop.

Wis., Wisconsin Rapids—T. A. Taylor, c/o Wood County Natl. Bank—machinery and tools for the manufacture of sheet iron products, also belting and shafting.

Que., Montreal—V. Mayer, 1291 Pathenais St.—small lathe and other equipment for automobile repair shop and garage.

Machinery Wanted

Ark., McGehee — L. X. Jackson—newspaper and job equipment, including newspaper and job presses, belting, hangers, etc.

Calif., Azusa—Azusa Ice & Cold Storage Co.,—ice manufacturing equipment to replace that which was destroyed by fire.

Calif., Bell—C. E. Fowler, Box 1011—woodworking machinery for making doors and windows.

Calif., Fresno—Fresno Agricultural Wks., Tulare and L Sts., C. T. Spivey, 48 Olive Ave., Genl. Mgr.—$10,000 worth of equipment and machinery.

Calif., Palo Alto—C. H. Steere Mfg. Co., (woodworking plant)—two power belt sanders and one automatic cutoff saw.

D. C., Wash.—G. T. Santmyer, 1340 I St., N. W.—$100,000 worth of machinery and equipment for the manufacture of concrete blocks.

Fla., Jacksonville—H. W. Dexter, Box 665 (machinery, etc.)—two stage air compressor, locomotive type, for use on dredge boat for air tools; one yard steam shovel, crawler or caterpillar type.

Fla., St. Petersburg—Marine Ways Machine Co., Inc., J. W. Appley, Pres.—power blacksmith hammer, Bradly-Helve or similar style (used).

Ga., Athens—H. H. Hinton—brick plant machinery, electrically operated.

Ga., Augusta — A. H. Merry, foot of Gwinnet St.—machinery and equipment for the manufacture of brick.

Ill., Chicago—Print Shop, 9 West Kinzie St.—12 x 18 in. power Gordon printing press and other job printing equipment.

Ill., Chicago—M. M. Rothschild, 712 Federal St.—one Harris two color automatic printing press.

Ill., Minonk—News Dispatch—large 32 in. power paper cutter and casting box.

Ill., Rockford—C. J. Clothier, Peach St. —machinery to crush limestone.

Ind., Hammond—F. S. Bets—shear for plate up to 10 ft. wide.

Kan., Barnard—G. F. Wilson—complete job printing equipment, including Junior linotype, pulleys, hangers and belting.

Kan., Kansas City—W. C. Weinert, 921 Minnesota Ave.—tinsmith equipment, including tinner's bench tools.

Kan., Wichita—Keenan Printing Co., 109 South Washington St., E. C. Keenan, Purch. Agt.—power automatic printing press for job work, also power punch.

Kan., Wichita—Model Press, 120 North Emporia St.—automatic job power printing press, metal cutter and other equipment.

Kan., Wichita — Wichita Beacon, South Main St., H. J. Allen, Purch. Agt.—large newspaper press.

La., New Orleans—Bd. Comrs. of the Port of New Orleans, Suite 200, New Court House—receiving bids until Feb. 8 for four portable coffee conveyors for Poydras St. Shed.

Mass., Adams—School Com.—machinery and woodworking tools for vocational department of new $350,000 high school.

Mass., Cambridge—West End Sash Co., 53 Bridge St.—woodworking machinery, to replace that which was destroyed by fire (new or used).

Mass., Lawrence—Pacific Mills, Inc., (manufacturer of cotton)—machinery and equipment for $2,000,000 bleaching and finishing plant at Spartansburg, S. C.

Mich., Grand Rapids — Adzit Printers' Supply Co., 41 Ellsworth Ave., S. W.—Miehle printing presses.

Minn., Minneapolis—Electric Mchy. Mfg. Co., 1331 Tyler St., N. E., S. McClure, Pres.—planer for pattern room; cutoff and power saw for crating department.

Minn., Minneapolis—J. Page, 500 South 4th St. (newspaper)—linotype and intertype.

Mo., Clayton—Leader Printing & Publishing Co., 115 South Meramec St., C. C. Crossman, 446 Forsythe Blvd., Purch. Agt. —linotype, presses, etc., for weekly newspaper plant.

Mo., Joplin—Littleson Shop, 1305 Joplin St., A. Littleson, Purch. Agt.—woodworking machinery for pattern shop, including belting, pulleys, saw, hangers, cutting off machine, motor, planer and sander.

Mo., Joplin—W. J. Scafe, Bartlett Bldg., (oil producer)—drilling machine.

Mo., Kansas City—Amer. Ice Co., Agnes Ave. and Guinotte St.—ice manufacturing equipment and handling machinery for proposed plant at 4730 Tracy Ave.

Mo., Kansas City—Evans-Thwing Refining Co., 624 Finance Bldg.—machinery and equipment for proposed refinery at El Dorado, Kan.

Mo., Kansas City—Rollins & Co., Engrs., 521 Railway Exc. Bldg.—ice making machinery and equipment.

Mo., Kansas City—Wear-O Well Shoe Co., 2108 Central St.—roller conveyor for shoe and leather working.

Mo., Kansas City—Weatherproof Products, 43rd and Main Sts.—square and tinner's brake.

Mo., St. Louis — Moloney Electric Co., 1149 South 7th St.—complete equipment for the manufacture of transformers for new plant at Toronto, Ont.

Neb., Beatrice—Bd. Educ.—complete woodworking and iron working machinery for vocational department of $100,000 school.

Neb., Callaway — J. C. Naylor, (newspaper)—14 x 22 in. Gordon press and power paper cutter.

Neb., Omaha—Bd. Educ.—belt driven air compressor, capacity 6 cu.ft. per minute under 300 lb. pressure.

N. J., Belleville—Prudential Silk Hosiery Co., Main St., M. Haensel, Purch. Agt.—machinery for addition to knitting mill.

N. J., Newark—G. W. Heath & Co., 208 1st St. (manufacturer of fountain pens)—several screw machines, Brown & Sharpe preferred.

N. J., Nixon—Nixon Nitration Co. (manufacturer of nitrate and celluloid products) —machinery and equipment for vaporization department, to replace that which was destroyed by fire.

N. Y., Buffalo—E. Ahr & Son, 1016 Lafayette Ave.—two 20,000 gal. tanks, pumps and other equipment for gasoline and oil storage.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Pig-iron prices firmer, owing to scarcity of iron and steel scrap. Basic up $3 and bessemer, $2 per ton at Pittsburgh. Demand for steel plates and structural shapes continues active; mills well booked for present quarter, with prices firmly placed at minimum of $2.10 per 100 lb., f.o.b. mill. Quotations nearing minimum of $2.10 on bars, with tendency to go higher. Wrought steel pipe discounts dropped two points on Pittsburgh basing card; warehouse discounts as yet unaffected. Boiler tubes up $6 per ton at mill, during week. Steel shapes now $3.29 as against $3.14 per 100 lb. in New York warehouses. Bars, $3.19 as compared with $3.04, one week ago. Tin advanced 1⅝c. per lb. in New York; lead, zinc and antimony markets also higher. Both white and red lead, dry and in oil, rose ½c. per lb. during week, following advance in lead metal. Large orders booked for spring delivery.

Declines—None reported in New York, Cleveland or Chicago, during week.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$27.55
Northern Basic	29.27
Southern Ohio No. 2	29.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	33.44
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	29.76@30.14
Virginia No. 2	33.17
Basic	28.00
Grey Forge	28.14
CHICAGO	
No. 2 Foundry local	29.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	28.00
Basic	29.27
Bessemer	29.27

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.0
Cleveland	5½@6
Cincinnati	4½@6
New York	5.5
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50@2.75	4.19	3.65	4.00
No. 12	2.60@2.85	4.24	3.70	4.05
No. 14	2.70@2.95	4.29	3.75	4.10
No. 16	2.90@3.15	4.39	3.85	4.20
Black				
Nos. 17 and 21.	3.20@3.35	4.70	4.05	4.70
Nos. 22 and 24.	3.25@3.40	4.75	4.10	4.70
Nos. 25 and 26.	3.30@3.45	4.80	4.15	4.75
No. 28	3.35@3.50	4.90	4.25	4.85

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	3.35@3.50	4.90	4.15	4.85
Nos. 12 and 14.	3.45@3.60	5.00	4.25	4.95
Nos. 17 and 21.	3.75@3.90	5.30	4.55	....
Nos. 22 and 24.	3.90@4.05	5.45	4.70	5.40
No. 26	4.05@4.20	5.60	4.95	5.55
No. 28	4.35@4.50	5.90	5.25	5.90

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	66@64	54½@53½	⅜ to 1¼	34	19
		LAP WELD			
2	59@57	47½@45½	2	29	15
2½ to 6	63@61	51½@50½	2½ to 4	32	19
7 to 8	60@58	47½@46½	4½ to 6	32	19
9 to 12	59@57	46½@45½	7 to 12	30	17
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1¼	64@62	53½@52½	⅜ to 1¼	34	20
2 to 3	65@63	54½@53½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	57@55	46½@45½	2	30	17
2½ to 4	61@59	50½@45½	2½ to 4	33	21
4½ to 6	60@58	49½@48½	4½ to 6	32	20
7 to 8	56@54	43½@42½	7 to 8	25	13
9 to 12	50@48	37½@36½	9 to 12	20	8

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	57%	44%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	54%	41%	53½%	40½%	59½%	45½%

Malleable fittings: Classes B and C, banded, from New York stock sell at list less 1%. Cast iron, standard sizes, 29% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.54	4.36	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.30	5.50
Cold finished shafting or screw	4.05	3.75	3.70
Cold finished flats, squares	4.55	4.25	4.20
Structural shapes (base)	3.29	3.16	3.02½
Soft steel bars (base)	3.19	3.06	2.92½
Soft steel bar shapes (base)	3.19	3.06	2.92½
Soft steel bands (base)	3.99	3.61	3.55
Tank plates (base)	3.29	3.01	3.02½
Bar iron (2.75 at mill)	3.04	2.91	2.92½
Drill rod (from list)	55@60%	40@55%	50%
Electric welding wire:			
5/8	8.50		12@13
⅛	7.00		11@12
5/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.37½
Tin, 5-ton lots, New York			41.00
Lead (up to carlots), St. Louis	8.05;	New York,	8.87½
Zinc (up to carlots), St. Louis	6.90;	New York,	7.35

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	25.00	23.00
Antimony (Chinese), ton spot	8.00	8.50	7.25
Copper sheets, base	23.50	22.00	23.00
Copper wire (carlots)	16.62½	18.75	16.25
Copper bars (carlots)	20.50	22.75	19.50
Copper tubing (carlots)	25.25	25.75	23.00
Brass sheets (carlots)	19.00	21.75	18.75
Brass tubing (carlots)	23.50	24.75	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (carlots)	17.00	20.00	15.75
Brass wire (carlots)	19.50	20.75	.....
Zinc sheets (casks)	10.25	10.25	.....
Solder (½ and ¼), (caselots)	29.00	26.25	20.00
Babbitt metal (83% tin)	42.00	49.00	36.00
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	12.75	12.25
Copper, heavy, and wire	12.25	12.25	11.75
Copper, light, and bottoms	10.50	10.75	11.00
Lead, heavy	5.75	6.00	6.00
Lead, tea	5.25	4.75	4.75
Brass, heavy, yellow	7.00	.....	.....
Brass, heavy, red	9.50	10.25	9.50
Brass, light	6.00	6.00	6.50
No. 1 yellow brass turnings	7.00	7.50	7.50
Zinc	4 50	4.50	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.00	11.50	14.50
IC,	112 sheets	12.30	11.90	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.11½	$0.13	$0.11½
Cotton waste, colored, per lb.	.08½	.10	.08
Wiping cloths, 13½x13½, per lb.	.16	32.00 per M	.10
Wiping cloths, 13½x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.60	2.40	2.65
Roll sulphur, per 100 lb	3.40	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.93	1.01	.98
White lead, dry or in oil	100 lb. kegs.	New York, 14.25	
Red lead, dry	100 lb. kegs.	New York, 14.25	
Red lead, in oil	100 lb. kegs.	New York, 15.75	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$8.25@8.50	
Coke, prompt foundry, Connellsville	per net ton	9.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40%	50-10-5%	50%
1¼ and 1¼x3 in. up to 12 in.	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	40-10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ⅜ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off hst	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.50	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	60%	50-10%	40-10%
Second grade	65%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

N. Y., Buffalo—Dunlop Tire & Rubber Co., River Rd.—tire making machinery.

N. Y., Buffalo — Hendon Chemical Co., c/o H. C. Minard, Erie County Bank Bldg. —machinery and equipment for the manufacture of chemicals.

N. Y., Buffalo—Hutchins Marine Laundry, 21-25 Moore St.—laundry machinery.

N. Y., Buffalo—Kasers Art Leather Shop, 45 Brown St.—equipment for the manufacture of leather hand bags and novelties.

N. Y., Buffalo—W. Sheehan, 586 Michigan Ave., (broom factory)—small single sticker, 4 or 6 in.

N. Y., Buffalo — Watkins Commercial Body Corp., 666 Genesee St.—equipment for the manufacture of commercial automobile bodies.

N. Y., Carthage—Crooks & McLean Co., Inc., 225 State St., (marble), E. C. Crooks, Purch. Agt.—one 2½ ton and two 5 ton triple geared chain hoists.

N. Y., Chaumont—C. N. Arnold—shafting, bearings and belting for flour mill.

N. Y., Clyde—Jewett Bros., (manufacturer of silk)—silk looms and machinery for the manufacture of crepe.

N. Y., Dundee—Penn Yan Cider Co.—machinery and equipment for canning factory.

N. Y., East Concord—East Concord Milling Corp.—feed mill machinery and equipment.

N. Y., Endicott—Endicott Johnson Corp. —machinery and equipment for sole leather tannery.

N. Y., Fredonia — Wright Veneer Co., Eagle St.—machinery and equipment for veneer mill, to replace that which was destroyed by fire.

N. Y., Geneva—Geneva Vacuum Bottle Co., R. S. Ellinwood, Mgr.—machinery and equipment for plant for the manufacture of thermos bottles.

N. Y., Honeoye Falls—B. Warren—machinery and equipment for the manufacture of automobile delivery truck bodies.

N. Y., Johnstown—Bd. Educ.—vocational equipment for $325,000 school.

N. Y., Lakewood—Bd. Educ.—vocational equipment for proposed high school.

N. Y., Macedon Center—M. Hicks—one job press.

N. Y., Medina—Medina Cabinet Co.—woodworking machinery, to replace that which was destroyed by fire.

N. Y., Medina—New York Canners, Inc. —machinery and equipment for proposed addition to cannery.

N. Y., New Hartford—Olympian Knit Goods Co., C. H. Oakes, Purch. Agt.—machinery for knitting mill.

N. Y., New York—Lane Franklin, 246 East 60th St.—complete newspaper equipment (used).

N. Y., North Tonawanda—Lennox Furniture Co.—woodworking machinery and equipment for proposed factory.

N. Y., Olean—H. C. Furniss—special machinery and equipment for the manufacture of patent machine lift of steel.

N. Y., Oswego—Netherlands Co., Inc.—cold storage and milk pasteurization equipment.

N. Y., Rochester—Dominion Feldspar Corp., foot of Bozart St.—grinding mill machinery and equipment.

N. Y., Watertown—Dawson & Pound, 252 Weldon Pl., (machine shop), C. H. Dawson, Purch. Agt.—heavy duty oxy-acetylene welding equipment and spring steel.

N. Y., Watertown — Jiffy Auto Chain Corp., 88 Main St., W. W. Chamberlain, Otis Bldg., Purch. Agt.—special machinery for the manufacture of steel automobile chains.

N. Y., Wellsville—Standard Turbine Co., E. C. Brown, Treas.—machinery and equipment for the manufacture of turbines, etc.

N. C., Bladenboro — Bladenboro Cotton Mill Co., H. C. Bridger, Pres.—equipment for proposed plant.

N. C., Hickory—Yeager Mfg. Co., Inc. (manufacturer of dining room furniture), M. Yeager, Secy. and Treas.—woodworking machinery, including finish spraying machines and dry kiln equipment.

N. D., Portland—E. Fladeland—complete newspaper equipment.

O., Cincinnati—D. J. Joseph Co., 1234 Harrison Ave., (scrap iron dealer)—alligator shear for cutting ½ in. scrap metal.

O., Columbus—Armo Mfg. Co., 130 East Goodall St. (manufacturer of automobile polish, etc.), C. W. Bell, Mgr.—one fluid mixer.

O., Columbus — Brandt & Hollerbaugh, 303 Commerce Bldg., (manufacturers of stucco), F. D. Brandt, Purch. Agt.—one pump, 1,250 gal. per minute; two mixers, for plant near Bremen.

O., Columbus—City Ice Supply & Coal Co., Frebis Ave. and 22nd St., E. Prior, Genl. Mgr.—complete equipment for modern retail coal yard.

O., Columbus—Columbus Forge & Iron Co., foot of First Ave., (manufacturer of forges, etc.), D. W. Singleton, Secy.—equipment to enlarge plant.

O., Columbus—Medick-Barrows Co., 135 East Gay St., (photo supplies), C. T. Anderson, Asst. Secy. and Treas.—one 54 in. cutter.

O., Hamden—Alco Fdry. & Machine Co., J. Abele, Pres.—foundry and machine shop equipment.

O., Springfield — Everwear Mfg. Co. (manufacturer of playground apparatus)—plating and galvanizing equipment for proposed addition to plant.

O., Struthers—Bd. Educ.—receiving bids for general vocational equipment, including woodworking and machine shop equipment.

O., Youngstown—F. M. Stolle, 402 Carroll St.—complete bakeshop equipment, including mixer, ovens, etc.

Okla., Tulsa—A. H. Nielson, 1631 1st St. equipment for the manufacture of patented sucker rod socket for oil country.

Okla., Wynne Wood—Commercial Club—complete ice plant.

Pa., Allentown—Merkel Bobbin Co., East End—machinery and equipment for proposed bobbin plant.

Pa., Beaver Falls—D. A. Sharff, 7th Ave. and 20th St. (milk)—pasteurizing and bottling machine.

Pa., Canonsburg — Canonsburg Steel & Iron Co., J. M. Watson, Mgr.—crimping machines for addition to plant.

Pa., Coudersport—Coudersport & Port Allegheny R.R., R. A. Knox, Purch. Agt.—equipment for locomotive shop, to replace that which was destroyed by fire.

Pa., Dallas — Lycoming Knitting Mills, S. W. Henry, Secy.—18 modern knitting machines.

Pa., Erie—Natl. Fdry. Co., 15th and Sassafras Sts.—equipment for proposed addition to foundry.

Pa., Grove City—Lawrence Fdry. Co., W. Christy, Mgr.—equipment to enlarge foundry.

Pa., Lancaster—Lancaster Steel Products Corp., J. J. Stunzi, Consulting Engr.—three 2 ton, 3 motor, 30 ft. span, traveling cranes.

Pa., Oil City—Penn-Amer. Refining Co.—machinery and equipment for gasoline cracking process plant.

Pa., Phila.—Beswick & Clay Co., Inc., 25th and Callowhill Sts., T. W. W. Clay, Purch. Agt.—sets, spindles, dyeing machinery, belting, etc., for proposed textile mills.

Pa., Phila.—Pennsylvania Laundry Co., 32nd St. and Powelton Ave.—extractors, washing machines, mangles, etc.

Pa., Phila.—Regent Knitting Mills, 221 North 23rd St.—knitting machines, latch needle, belting, etc.

Pa., Phila.—Taubel Bros., Inc., Cedar St. and Huntington Ave., (manufacturer of hosiery), G. L. Taubel, Purch. Agt.—latch needle machine, loopers, etc.

Pa., Pittsburgh — National Tube Co., Frick Bldg., S. M. Lynch, Purch. Agt.—plate shear for 2 in. plates.

Pa., Scranton—Fairmont Creamery Co., 30 Lackawanna Ave.—dairy machinery and equipment, including conveying machinery, for proposed plant on 6th Ave.

Pa., Scranton—Scranton Coal Co., Bd. of Trade Bldg.—coal mining machinery and equipment for new vein at Keyser Valley.

Pa., Scranton—A. Ziegler, 916 Norton St. machinery for the manufacture of coin vending machine.

Pa., Terre Hill—C. Zorn—tobacco packing machinery and equipment, including press, scales and truck.

Pa., Titusville—Amer. Oil Wks.—machinery and equipment for cracking plant for the manufacture of gasoline.

Pa., Warren—Mutual Refining Co.—machinery and equipment for proposed gas and oil cracking plant.

Pa., Waymart—D. J. Necio—woodworking machinery, including one Rew saw and one Tenotus saw.

Pa., West Middlesex—R. T. Rankin—machinery and equipment for refuse and wasting plant on 80 acre site at Pulaski.

Pa., Wilkes-Barre—Central Poor Dist., 30 South Franklin St., G. K. Brown, Secy.—receiving bids until Feb. 8, mechanical refrigeration equipment.

Pa., Wilkes-Barre—Hazard Mfg. Co., 81 East Ross St. (manufacturer of wire rope and products)—machinery and equipment for branch plant at Fort Worth, Tex.

Pa., Wilkes-Barre—Shepherd Constr. Co., Miners Bank Bldg., W. C. Shepherd, Pres. —machinery and equipment for the manufacture of building supplies.

S. D., Winner—W. Selthauser—one 8 x 10 or 10 x 10 in. rock crusher (new or used).

Tenn., Chattanooga—Casey Hedges Co.—one 175 ton riveter.

Tenn., Manchester—J. H. Ashley—complete 10 ton ice plant (used).

Tex., Brownwood — City Comn., J. R. Looney, Mayor—equipment for woodworking and light metal working shop in proposed $100,000 Junior High School.

Tex., Dallas—Dallas Trunk Factory, 1005 Main St.—power leather working machine for making patches.

Tex., Houston—Texas Supply Co., 2016 Loraine St. (oil well supplies)—car load lots of pipe or casing.

Tex., McKinney—The city, H. C. Miller, Mayor—manual training equipment for proposed $100,000 Junior High School.

Tex., Waco—Nelson Mfg. Co.—woodworking machinery and planing mill equipment.

Va., Chilesburg — Chilesburg Excelsior Lumber Co., L. H. Chewing, Purch. Agt.—excelsior machinery and parts, including belting, circular saw, cutoff saw, machine knives and files.

Va., Prince George—J. E. Cousins, Jr., (well drilling and repairing, pump erecting, etc.)—deep well pumps, upright engines of various sizes, tanks and towers.

Va., Ruther Glen—Caroline Excelsior Co., H. B. Taylor, Purch. Agt.—excelsior machinery and parts, including 1 to 3½ in. valves, belting and cutoff saw.

Wis., Ableman—Bd. Educ., R. Jones, Clk. —manual training equipment for proposed high school.

Wis., Appleton—Bd. Educ., c/o Clerk—shop and manual training equipment for proposed $500,000 vocational high school.

Wis., Chippewa Falls—A. F. Ender—complete newspaper and job office equipment.

Wis., Madison—M. B. Allison, 315 Beaver Bldg.—laundry equipment, including dryers for proposed apartment building.

Wis., Madison—W. L. Dowling, c/o P. Dean, Archt., Dean Bldg.—laundry equipment, including dryers for proposed apartment building.

Wis., Marshfield — I. Jones, 110 West North Depot St.—power creamery machinery, belting and shafting.

Wis., Marshfield—S. Miller Cold Storage Co., Main St.—refrigeration machinery for proposed plant at Rhinelander.

Wis., Milwaukee — W. E. Baum, 1073 Cramer St.—25 in. paper cutting machine.

Wis., Milwaukee—Heinl & Sperry, 171 Bway., F. Heinl, Purch. Agt.—candy making machinery, power.

Wis., Milwaukee—W. S. Kowalewski, 40 Chambers St., (woodwork)—portable sawing machine.

Wis., Milwaukee—G. Ladwig, 668 American Ave., (carpentry and millwork)—window frame pocket and pulley machine, motor driven.

Wis., Milwaukee—H. R. Mayer, 1279 36th St., (woodwork and carpentry)—portable sawing machine outfit.

Wis., Milwaukee—J. Meyer, 861 29th St. Universal woodworking machine.

Wis., Milwaukee—Natl. Distilling Co., 79 Buffalo St., (manufacturer of vinegar, etc.) —refrigeration and conveying machinery.

Wis., Milwaukee—S. Schmidt, 200 Hadley St., (carpentry and millwork) — portable sawing outfit, gasoline engine or motor power.

Wis., Milwaukee—J. C. Spanheimer, 828 34th St., (carpentry and woodwork)—portable sawing machine.

Wis., Milwaukee—S. Stern, 541 Muskego Ave. — shoe repair machinery, electrically driven.

Wis., Milwaukee—W. F. Wittstock, 2622 North Ave. (fur shop)—one air compressor.

Wis., Nekoosa—C. A. Jasperson, (pulp, etc.)—traveling crane.

Wis., Oshkosh—Badger Lumber & Mfg. Co., Main and Jay Sts., E. E. Meeleus, Mgr.—woodworking machinery, etc., for proposed factory.

Wis., Plymouth—Wisconsin Dairymen's Storage Co., H. Kinnery, Pres.—refrigerating machinery for proposed cold storage warehouse at Oshkosh.

Wis., Portage—Nehl Boat & Furnace Co., W. Nehl, Mgr.—equipment for fabricating and assembling heating systems, also woodworking machinery for the manufacture of boats.

Wis., Stetsonville—Ripon Produce Co.—power churns and testers for proposed creamery.

Wis., Wausau—A. Kickbush Grocery Co., 126 West Washington Ave., Oppenhamer & Obel, Archts., Wausau, Purch. Agt.—refrigerating machinery for proposed cold storage warehouse.

Wis., West Allis—O. Dallman, 809 69th Ave.—combination woodworking machine, motor driven.

Wis., Wisconsin Rapids—Bd. Educ., G. O. Babcock, Pres.—manual training equipment for proposed grade school.

Alta., St. Paul de Metis—J. Balliere—complete machinery and equipment for shoe factory.

B. C., Vancouver—Dominion Government and Vancouver Harbour Comrs., 712 Pender St.—cleaning and conveying machinery for proposed addition to elevator.

Ont., Goderich—Goderich Elevator & Transit Co., c/o J. I. A. Hunt, Horton St.—electrical grain handling equipment.

Ont., Ottawa — Bonet Bros., Catherine St.—machinery and equipment for sash and door factory.

Ont., St. Thomas—E. Collins, (manufacturer of furniture)—woodworking machinery.

Ont., Shelburne—Hall Bros.—woodworking machinery for planing mill.

Ont., Toronto—Dominion Fdry. & Steel Co., Ltd., Canadian Pacific R.R. Bldg.—one open throat vertical shear.

Ont., Welland—Empire Cotton Co., J. Mills, Purch. Agt.—machinery and equipment for new plant.

Que., Granby—Leader-Mail Publishing Co.—drum cylinder press.

Que., Montreal—Red Star Oil Refineries, Ltd., Canada Cement Bldg.—machinery and equipment for oil refinery at Montreal East.

Metal Working Shops

Calif., Los Angeles—J. and D. Parkinson, Archts., Title Insurance Bldg., are receiving bids for the construction of a 2 story addition to automobile assembling plant for the Ford Motor Co., Santa Fe Ave. and East 17th St. Noted Jan. 25.

Calif., Richmond—J. P. Strom, 1229 Macdonald Ave., plans to build a 1 story garage and automobile salesroom. Estimated cost $50,000. Architect not announced.

Calif., San Francisco—S. Schell, 180 Jessie St., will build a 1 story automobile repair shop on Bryant and Center Sts. Estimated cost $10,000.

Calif., San Francisco—The Star Garage, 150 Turk St., is having revised plans prepared for the construction of a 2 story garage, 129 ft. long. T. McDougall, owner. J. L. Stewart, Claus Spreckels Bldg., Archt. Noted Jan. 4.

Calif., San Rafael—Marin Municipal Water Dist. is having plans prepared for the construction of shops, corporation yard and office building on 4th St. J. W. Dolliver, Monadnock Bldg., San Francisco, Archt.

Calif., South San Francisco (San Francisco P. O.)—The Metal & Thermit Corp., 120 Bway., New York City, is having plans prepared for the construction of a rolling mill on a 14 acre site on Swift St., here. Cost between $1,500,000 and $2,000,000. E. W. Kardos, c/o Swift & Co., Sonth San Francisco, Dist. Mgr. Private plans.

Ill., Centralia—The Pfeffer Motor Co. has had plans prepared for the construction of a 3 story, 80 x 160 ft. garage on Main St. Estimated cost $100,000. T. P. Barnett Co., 1559 Arcade Bldg., St. Louis, Archts.

Ill., Chicago—The Chicago Beach Hotel Co., 1600 Hyde Park Blvd., is having plans prepared for the construction of an 8 story, 100 x 200 ft. garage on Hyde Park Blvd. and Lake Michigan. Estimated cost $500,000. G. C. Nimmons, 122 South Michigan Ave., Archt.

Ill., Chicago—W. P. Doerr, Archt., 28 East Jackson Blvd., is receiving bids for the construction of a 1 and 2 story, 100 x 150 ft. garage on Lake Park Ave. and 55th St. for O. Metz, 5525 Harper Ave. Estimated cost $40,000.

Ill., Chicago—The H. H. Riis Motor Co., c/o Archt., is having plans prepared for the construction of a 2 story, 100 x 125 ft. garage, repair and welding shop on Fullerton St. near Crawford St. Estimated cost $100,000. M. H. Harris, 118 North LaSalle St., Archt.

Ill., Chicago—The Studebaker Sales Co., 21st St. and Michigan Ave., is having plans prepared for the construction of a 6 story, 100 x 300 ft. motor service station on Federal St. between 24th and 25th Sts. Estimated cost $750,000. Loewenberg & Loewenberg, 111 West Monroe St., Archts.

Ill., Granite City—The St. Louis Coke & Chemical Co. plans to build a blast furnace, will double present capacity of 500 tons of pig iron per day. Estimated cost $1,500,000. C. R. Holzworth, Genl. Supt.

Ind., East Chicago—The Pressed Steel Mfg. Co., 20 West Jackson Blvd., Chicago, is having plans prepared for the construction of a 2 story factory and office building, here. Estimated cost $750,000. F. D. Chase, Inc., 645 North Michigan Ave., Chicago, Archt.

Kan., Junction City—C. P. Duvay is having plans prepared for the construction of a 1 story, 54 x 150 ft. garage, service station and salesroom. Estimated cost $25,000. H. B. Winter, Union Natl. Bank Bldg., Junction City, Archt.

Kan., Kansas City—J. A. Combs, 713 Quindaro Blvd., is having plans prepared for the construction of a 1 story, 45 x 120 ft. garage and machine shop at 813-15 Quindaro Blvd. Estimated cost $10,000. Private plans.

Kan., Wichita — The Hayes Equipment Co., 701 East Gilbert St., awarded the contract for the construction of a 1 story, 79 x 232 ft. factory for the manufacture of oil tanks and pumps on Gilbert and Santa Fe Sts. Estimated cost $20,000. Noted Jan. 18.

Mo., St. Louis—The R. R. Davis Tool Co., 3217 Alfred St., awarded the contract for the construction of a 1 story, 50 x 100 ft. tool factory. Estimated cost $14,000.

Mo., St. Louis—The Midwest Piping & Supply Co., 1452 South 2nd St., awarded the contract for the construction of a 1 story addition to its pipe factory at 1441 Kosciusko St. Estimated cost $15,000.

N. Y., Binghamton — F. M. Hutchins plans to build a 2 story, 40 x 83 ft. garage on Hawly, Exchange and Myrtle Sts. Estimated cost $40,000. Architect not selected.

N. Y., Ithaca—The J. B. Lang Engine & Garage Co., 115 East Green St., is receiving bids for the construction of a 1 story, 60 x 100 ft. machine shop addition to its service and repair works. Estimated cost $35,000. Private plans.

N. Y., Niagara Falls—The Wood-Harmon Co. plans to build a garage on 3rd St. Estimated cost $40,000. Architect not announced. Niagara Falls Police Dept., Niagara and 2nd St., Lessee.

N. Y., Rochester—The Max Motor Co., 160 East Ave., plans to build a garage and service station on Court and Chestnut Sts. Cost will exceed $55,000. Architect not announced.

N. C., Salisburg—The Autovac Co., Inc., plans to build a factory for the manufacture of autovacs and other automobile parts, 500,000 yearly capacity. H. H. Rouzer, Pres. Architect not selected.

O., Cleveland—The Euclid Prospect Co., c/o A. G. McKee Co., Engrs., 2422 Euclid Ave., has had plans prepared for the construction of a 2 story, 48 x 77 ft. garage at 2443 Prospect Ave.

O., Cleveland—The Forest City Fdry. & Mfg. Co., 1220 Main Ave., plans to build a foundry on West 90th St. along tracks of Cleveland, Cincinnati, Chicago and St. Louis Ry. Estimated cost $200,000. C. F. Seelbach, Secy. Architect not selected.

O., Cleveland—A. Mechanic, 7829 Carnegie Ave., manufacturer of automobile accessories, awarded the contract for the construction of a 2 story, 33 x 37 ft. shop on East 82nd St. and Carnegie Ave. Estimated cost $30,000. Noted Dec. 14.

O., Cleveland—The Republic Brass Co., 1617 East 45th St., awarded the contract for the construction of a 1 story, 42 x 49 ft. core room. Estimated cost $25,000. A. Deutsch, Treas.

O., Cleveland Heights (Warrensville P. O.)—W. J. Austin, Pres. of the Austin Co., 16112 Euclid Ave., Cleveland, plans to build a service station on Lennox and Surrey Rds., here. Estimated cost $75,000. Private plans.

O., Hamden—The Alco Fdry. & Machine Co. plans to rebuild its foundry and machine shop, which was destroyed by fire. Estimated cost $25,000. J. Abele, Pres. Architect not announced.

O., Springfield—The Everwear Mfg. Co. is receiving bids for the construction of a 1 story, 90 x 220 ft. addition to its plant for the manufacture of playground apparatus, to be used at a plating and galvanizing department. Architect not announced.

Pa., Allentown—The Merkle Bobbin Co., East End, plans to build a plant for the manufacture of bobbins on 6th and Lehigh Sts. Estimated cost $50,000. Architect not announced.

Pa., Coudersport — The Coudersport & Port Allegheny R.R. plans to rebuild its round house and locomotive shops which were destroyed by fire. Cost between $10,000 and $15,000. Architect not announced.

Pa., Erie—The Natl. Fdry. Co., 15th and Sassafras Sts., awarded the contract for the construction of a 1 story, 96 x 122 ft. addition to its foundry. Estimated cost $23,000.

Pa., Erie—The Northwestern Motor Sales Co., 21st and State Sts., awarded the contract for the construction of a 2 story garage, to replace the one which was destroyed by fire. Estimated cost $40,000. Noted Dec. 7.

Pa., Pittsburgh—B. H. Prack, Engr. and Archt., Keystone Bldg., is receiving bids for the construction of a 5 story, 80 x 300 ft. manufacturing plant on Susquehanna St. for the Pittsburgh Meter Co., East Pittsburgh.

Pa., Pittsburgh—B. P. Tracey, 901 Pennsylvania Ave., awarded the contract for the construction of a 1 story, 80 x 200 ft. factory for the manufacture of mine supplies on Fulton and Page Sts. Estimated cost $50,000.

Pa., Shamokin—The Neel-Cadillac Co. is having plans prepared for the construction of a 1 story, 80 x 120 ft. service station. Estimated cost $40,000. W. H. Lee, 3220 17th St., Phila., Archt.

Tex., Waco—B. C. Richards, 919 South 8th St., is having plans prepared for the construction of a 2 story garage on 10th and Austin Sts. Estimated cost $40,000. Architect not announced.

Wis., La Crosse—O. A. Merman, Archt., 210 Linker Bldg., is receiving bids for the construction of a 1 story, 60 x 146 ft. garage on 6th and State Sts., for the Cameron Motor Car Co., 127 South 6th St. Estimated cost $40,000. Noted Nov. 30.

Wis., Stevens Point—F. Spalenka, Archt., 426 Normal Ave., will soon receive bids for the construction of a 2 story, 80 x 137 ft. garage for the R. E. Newby Auto Co., c/o Archt. Estimated cost $45,000.

Wis., Sturgeon Bay—The Lakeshore Motors Co. plans to build a 2 story, 60 x 90 ft. addition to its machine shop. Estimated cost $40,000. R. Herbold, Mgr. Architect not selected.

Ont., North Bay—Doyle Bros. plan to build a garage on Main St. Estimated cost $15,000.

General Manufacturing

Calif., Oakland—J. B. Bouchet, 20th St. and Telegraph Ave., awarded the contract for the construction of a 1 story cleaning and dyeing plant on 22nd and West Sts. Estimated cost $7,000.

Calif., Turlock—E. T. and W. P. Eaton, c/o Turlock Chamber of Commerce, have purchased site and plan to build an ice plant on North Center St. Estimated cost $30,000.

Ill., Chicago—The Garfield Sanitary Felt Co., 1132-36 North Cherry St., awarded the contract for the construction of a 2 story, 80 x 140 ft. factory. Estimated cost $50,000.

Ill., Chicago—Garibaldi & Cunco, 1 West South Water St., (fruits), are receiving bids for remodeling 4 story, 100 x 125 ft. factory at 212 West Illinois St. Estimated cost $50,000. Dean & Dean, 137 South La Salle St., Archts. Noted Jan. 11.

Ill., Chicago—Zimmerman, Saxe & Zimmerman, Archts., 212 East Superior Ave., are receiving bids for the construction of a 1 story, 80 x 164 ft. factory for the manufacture of elastic tape at 4113-35 Ravenswood St. for the Pike Web Mfg. Co., 29 South Clinton St. Estimated cost $40,000.

Ill., Kankakee—Lockwood, Greene & Co., Archts., 38 South Dearborn St., Chicago, are receiving bids for the construction of a 1 story, 60 x 80 ft. addition to factory on West Ave. and Merchant St., here, for the Paramount Hosiery Form Drying Co. Estimated cost $15,000.

Kan., Eldorado—The Evans-Thwing Refining Co., 624 Finance Bldg., Kansas City, Mo., is having plans prepared for the construction of a refinery, here. Estimated cost $500,000. Private plans.

Ky., Louisville — The Superior Woolen Mills plans to build a factory and sales building at 509-511 West Market St. Estimated cost $150,000. J. W. Strother, Treas.

Md., Baltimore—The Amer. Ice Co., Calvert Bldg., awarded the contract for the construction of a 2 story, 80 x 142 ft. ice plant on Eden St. between Madison and Monument Sts. Estimated cost $60,000. Noted Jan. 18.

Mass., Cambridge—Ginn & Co., 15 Ashburton Pl., Boston, awarded the contract for the construction of the foundation of a 5 story, 55 x 325 ft. printing plant on 1st St., here.

Mass., Gardner—O. W. Siebert & Co., Logan St., awarded the contract for the construction of a 4 story, 80 x 230 ft. factory for the manufacture of baby carriages, on Main St. Estimated cost $175,000.

Mass., Watertown — The Hood Rubber Co., Nichols Ave., awarded the contract for the construction of a 4 story addition to its rubber goods plant. Estimated cost $50,000.

Mich., Grand Rapids — The Paalman Furniture Co. is receiving bids for the construction of a 3 story, 30 x 42 ft. factory on Ionia St. Estimated cost $50,000. H. Weemhoff, Murray Bldg., Grand Rapids, Archt.

Mo., Kansas City—The Amer. Ice Co., Agnes Ave. and Guinotte St., is having plans prepared for the construction of a 2 story, 80 x 127 ft. ice plant at 4730 Tracy Ave. Estimated cost $75,000. G. Carman, 406 Gumbel Bldg., Archt.

Mo., St. Louis—The Benbow Realty & Investment Co., Fullerton Bldg., awarded the contract for the construction of a 1 story, 40 x 150 ft. factory for the manufacture of farm implements on Duncan Ave. Estimated cost $10,000.

Mo., St. Louis—The Natl. Lead Co., International Life Bldg., awarded the contract for alterations to its 1 and 2 story, 40 x 150 ft. lead works at 5560 Manchester Ave. Estimated cost $15,000.

Mo., St. Louis — The Warner-Jenkison Mfg. Co., 2526 Baldwin St., awarded the contract for the construction of a 1 story, 60 x 127 ft. addition to its factory for the manufacture of flavoring extracts. Estimated cost $31,000.

N. J., Elizabeth—The Elizabeth Daily Journal, 74 Broad St., is having plans prepared for the construction of a 3 story, 69 x 210 ft. newspaper plant. Estimated cost $175,000. C. G. Poggi, 275 Morris Ave., Elizabeth, Archt. Hollingsworth & Bragdon, 17 West 45th St., New York City, Associate Archts.

N. Y., Endicott—The Endicott Johnson Corp. is having plans prepared for the construction of a sole leather tannery. Estimated cost $65,000. S. J. Beebe, c/o owner, Engr.

N. Y., Fredonia — H. O. Schuchmann, 1232 Prendergast Ave., Jamestown, plans to build a furniture factory, here. Estimated cost $18,000. Architect not announced.

N. Y., Fredonia—The Wright Veneer Co., Eagle St., plans to rebuild its veneer mill, which was recently destroyed by fire. Estimated cost $20,000. Architect not announced.

N. Y., Medina—The Medina Cabinet Co. plans to rebuild its cabinet factory on West Oak Orchard St., which was destroyed by fire. Estimated cost $10,000. Architect not announced.

N. Y., Medina—The New York Canners, Inc., plans to build a large addition to its canning factory. Cost will exceed $25,000. Architect not announced.

N. Y., North Tonawanda—The Lennox Furniture Co. plans to build a furniture factory on Miller St. Cost will exceed $20,000. Architect not announced.

N. Y., Ogdensburg—The Standard Shade Roller Co. plans to build an addition to its plant. Cost between $40,000 and $50,000. H. M. Wheaton, Mgr.

N. C., Bladenboro—The Bladenboro Cotton Mill Co. plans to build plant No. 3. Estimated cost $400,000. H. C. Bridger, Pres.

N. C., Lenoir—The Nelson Cotton Mill Co., Charlotte, is having plans prepared for the construction of a cotton spinning mill, 6,000 spindle capacity, here. R. C. Biberstein, 1615 Elizabeth Ave., Charlotte, Archt.

N. C., Lumberton—The Lumberton Cotton Mills having plans prepared for the construction of a weave room addition, 600 loom capacity. H. B. Jennings, Pres. Lockwood, Greene & Co., Piedmont Bldg., Charlotte, Engrs.

N. C., Lumberton—The Mansfield Mill Co. plans to build a weaving mill, 600 loom capacity. H. B. Jennings, Pres.

N. C., Morganton—The Drexel Furniture Co. awarded the contract for the construction of a 2 story, 75 x 304 ft. addition to its furniture factory. Estimated cost $50,000.

N. C., Reidsville—W. L. Pannill, Reidsville, and R. Graham, Winston-Salem, plan to build mill for the manufacture of knit underwear, here. Estimated cost $150,000.

N. C., Shelby—The Eagle Roller Mills Co. plans to build a 6 story roller mill with 400 bbl. capacity. Estimated cost $70,000. W. R. Hartness, Pres.

N. C., Wadesboro—L. D. Robinson is interested in a company composed of local citizens who have subscribed $425,000 to build a cotton mill, to spin yarn, weave, bleach, dye and print goods.

O., Bellefontaine — The Citizens Ice & Supply Co. is receiving bids and will open same about March 1 for the construction of an ice and storage plant. Estimated cost $85,000. J. H. Meyer, Wapakonea, Archt.

Okla., Tulsa—E. S. Hutchinson has had preliminary plans prepared for the construction of a 1 story furniture plant, to contain 20,000 ft. of floor space, at 623 South Xanthus St. Estimated cost $150,000.

Pa., Ambridge—C. Kristufek, 300 Park Ave., is receiving bids for the construction of a 1 story, 42 x 70, 30 x 50, 24 x 50 and 24 x 140 ft. planing mill on 23rd St. and Cass Ave. Estimated cost $50,000. Private plans.

Pa., Bethlehem—The Allentown Bethlehem Gas Co. is having plans prepared for the construction of a 1 story liquid purification plant, 8,000,000 cu.ft. capacity, including patent combination absorber and actefier. Estimated cost $55,000. Koppers Co., Union Arcade, Pittsburgh, Archts.

Pa., Harrisburg—The Harris Knitting Co. has had plans prepared for the construction of a 3 story, 80 x 125 ft. knitting mill on 4th and Dauphin Sts. Estimated cost $100,000. J. L. Shearer, Jr., 2434 North 2nd St., Pres. Architect not announced.

Pa., Hayesville — The Sterling Varnish Co., 528 Fulton Bldg., Pittsburgh, awarded the contract for the construction of a 1 story, 30 x 50 ft. and 60 x 60 ft. factory, here, to replace the one which was destroyed by fire. Estimated cost $10,000.

Pa., Morrellville (Johnstown P. O.)—Henderson Bros., Inc., Market St., Johnstown, plan to build a 3 story, 80 x 125 ft. dry cleaning plant, here. Estimated cost, including equipment, $200,000. E. A. Henderson, Pres.

Pa., Phila.—The Art Loom Rug Mills, Hancock and Westmoreland Sts., awarded the contract for the construction of a 2 and 3 story textile factory. Estimated cost $100,000.

Pa., Phila.—Beswick & Clay Co., Inc., 25th and Callowhill Sts., is having plans prepared for the construction of 1 and 3 story textile mills on 68th St. and Greenway Ave. Estimated cost $500,000. F. W. Easby, Crozier Bldg., Engr.

Pa., Phila.—The New Way Laundry Co., 4809 Aspen St., awarded the contract for the construction of a 2 story, 65 x 80 ft. laundry.

Pa., Phila.—W. F. Reed & Sons, 12th St. and Snyder Ave., awarded the contract for the construction of a 5 story, 65 x 70 ft. textile factory on 12th and Jackson Sts. Estimated cost $200,000.

Pa., Pittsburgh—The Linde Air Products Co., 30 East 42nd St., New York City, will soon award the contract for the construction of an oxygen manufacturing plant, consisting of a 1 and 2 story, 101 x 161 ft. main building, a 1 story, 14 x 20 ft. cylinder building and a 1 story, 26 x 52 ft. oil storage building on Westfall St., here. Private plans.

Pa., Pittsburgh—Smith Bros. Co., Inc., 409 Grant St., awarded the contract for remodeling and building a 3 story, 23 x 50 ft. addition to its publishing plant. Estimated cost $70,000. Noted Dec. 28.

Pa., Scranton—The Fairmont Creamery Co., 30 Lackawanna Ave., plans to build a dairy on 6th Ave. Estimated cost $48,500. Architect not announced.

Pa., West Chester—W. Corcoran, Archt., will receive bids until Feb. 1, for the construction of a 2 story, 30 x 50 ft. creamery for E. Eachus, Bradford Ave. Estimated cost $25,000.

R. I., Newport—The Amer. Cigar Co. is having plans prepared for the construction of a 2 story, 60 x 166 ft. cigar factory on Central Wharf. Estimated cost $50,000. Private plans.

R. I., Pawtucket—Perry & Whipple, Engrs. and Archts., Hospital Trust Bldg., Providence, are receiving bids for the construction of a 1 story, 40 x 90 and 45 x 60 ft. addition to mill for the Tubular Woven Fabric Co., Pawtucket Ave., here. Cost between $35,000 and $40,000.

R. I., Shannock—The Columbia Narrow Fabric Co. awarded the contract for the construction of a 1 story, 60 x 180 ft. weave shed for the manufacture of narrow fabric materials. Estimated cost $45,000.

S. D., Rapid City—The State Cement Comn., Capitol, Pierre, has had plans prepared for the construction of a cement plant, capacity 2,000 bbl. per day, here. A. C. Hunt, Secy., J. C. Buckbee, 38 South Dearborn St., Chicago, Engr.

Tenn., Nashville—The McQuiddy Printing Co., 5th Ave. and Diaderick St., is having plans prepared and will soon receive bids for the construction of a 3 story, 65 x 150 ft. printing plant, on Broad St. Cost between $50,000 and $60,000. H. C. Hibbs, 4th and 1st Natl. Bank Bldg., Archt.

Tenn., Nashville—The Nashville Abbattoir & Hide Assn., 1416 Adams Ave., plans to build an addition to its plant, including ice plant. Estimated cost $6,000.

Tex., Breckenridge—The Great Texas Oil & Refinery Co. is receiving bids for the construction of a refinery, including four 2 story buildings, daily capacity of oil refinery 5,000 bbl., storage capacity 200,000 bbl. Estimated cost $1,200,000.

Tex., Houston—D. D. Pittman, Archt., Prince Theatre Bldg., will receive bids in April for the construction of an 8 story ice plant and warehouse, for the South Texas Cold Storage & Warehouse Co. Estimated cost $1,080,000.

W. Va., Charleston—The Owens Bottle Co., 1401 Nicholas Bldg., Toledo, Ohio, awarded the contract for the construction of foundation and structural steel work on a 1 story, 120 x 200 ft. addition to its factory. Estimated cost $150,000. Noted Oct. 5.

W. Va., Fairview—The Marion Constr. Co. plans to rebuild its planing mill which was destroyed by fire. Estimated cost $60,000. T. R. Montgomery, Mgr. Architect not announced.

W. Va., Huntington — The South Point Oil Co., 1st Natl. Bank Bldg., plans to build a 15 mile pipe line and several pumping plants. Estimated cost $100,000. L. H. Lipsey, Pres.

Wis., Madison—C. Rieder, 615 University Ave., is having plans prepared for the construction of a 3 story, 50 x 65 ft. tire and vulcanizing shop. Estimated cost $50,000. P. M. Homer, 1 East Main St., Madison, Archt.

Wis., Marshfield — The S. Miller Cold Storage Co., Main St., is having plans prepared for the construction of a 3 story, 52 x 130 ft. addition to its cold storage plant. Estimated cost $150,000. M. R. Carpenter, 72 West Washington St., Chicago, Engr. and Archt.

Wis., Milwaukee—The Purity Mfg. Co., 1098 35th St., awarded the contract for the construction of a 1 story, 50 x 120 ft. factory for the manufacture of noodles, etc., on 30th St. Estimated cost $20,000.

Wis., Milwaukee—J. Wilging & Co., 1612 Teutonia Ave., awarded the contract for the construction of a 3 story, 60 x 120 ft. woodworking plant on 30th St. Estimated cost $30,000. Noted Jan. 11.

Wis., Random Lake — The Krier Preserving Co., Belgium, awarded the contract for the construction of a 2 story, 50 x 240 ft. and a 1 story, 60 x 100 ft. canning plant, here. Estimated cost $100,000. Noted Dec. 14.

Wis., Sheboygan—The Northern Furniture Co. is receiving bids for the construction of a 2 story, 185 x 200 ft. furniture factory. Estimated cost $75,000. W. C. Weeks, Sheboygan, Archt. Noted Jan. 4.

Wis., Waukesha—The Harvey Paper Specialty Co., 453 West Main St., plans to build a 1 story (ultimately 2 story) 80 x 200 ft. factory and warehouse. Estimated cost $40,000. Architect not selected.

Ont., Welland—The No Egg Products Co., Ltd., plans to rebuild its food products plant on North Main St., which was destroyed by fire. Estimated cost $7,500. Architect not announced.

Que., Donnacona—The Donnacona Paper Co., Ltd., plans to double capacity of its new print mill from 30,000 to 60,000 ton. H. P. Gould, Lyons Fall, N. Y., Pres., C. L. Eaton, Watertown, N. Y., Engr.